PB97-963117
EPA/541/R-97/041
November 1997

EPA Superfund
Explanation of Significant Difference for the Record of Decision:

Selma Treating Co.,
Selma, CA
4/18/1997

EXPLANATION OF SIGNIFICANT DIFFERENCES DECLARATION

SITE NAME AND LOCATION

Selma Pressure Treating Superfund Site
Selma, California

STATEMENT OF BASIS AND PURPOSE

On September 24, 1988, the United States Environmental Protection Agency ("EPA") signed the Record of Decision ("1988 ROD") for the Selma Pressure Treating Superfund Site in Selma, California ("Site"). This Explanation of Significant Differences #2 ("ESD2") explains the significant differences between the remedial action selected in the 1988 ROD, as changed by the Explanation of Significant Differences issued in 1993 (1993 ESD), and the remedial action which will be implemented at the Site. (The 1988 ROD and the 1993 ESD are collectively referred to herein as the "ROD".) It was developed in accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), as amended, and 40 C.F.R. 300.435 © (2) (I) (55 Fed. Reg. 8666, 8852 March 8, 1990) of the National Contingency Plan ("NCP"). This decision is based on the administrative record for this Site.

SUMMARY

This ESD2 explains changes in certain remedial action details pertaining to the return of the treated water to the aquifer as described in the ROD. The 1988 ROD selected a groundwater remedy which would employ a conventional precipitation, coagulation, and flocculation extraction and treatment process, with either reinjection or off-site disposal of the treated effluent. Based on reconsideration of certain technical information during the design phase and additional data gathered pursuant to the ROD, EPA proposes to modify the remedy by using percolation ponds to return the treated water to the aquifer. All other aspects of the selected groundwater remedy are as described in the ROD, including the scope and the cleanup standards.

DECLARATION

This remedy remains protective of human health and the environment, and continues to comply with applicable or relevant and appropriate federal and state requirements that were identified in the 1988 ROD, the 1993 ESD, and this ESD2. The selected remedy also remains cost-effective and continues to use permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site. Finally, the selected remedy continues to employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes.

Keith Takata

Keith Takata, Director
Superfund Division

4-18-97

Date

SELMA PRESSURE TREATING SUPERFUND SITE

Explanation of Significant Differences

April 18, 1997

I. Introduction

On September 24, 1988, the United States Environmental Protection Agency ("EPA") signed the Record of Decision ("1988 ROD") for the Selma Pressure Treating Superfund Site in Selma, California ("Site"). This Explanation of Significant Differences #2 ("ESD2") explains the significant differences between the remedial action selected in the 1988 ROD, as changed by the Explanation of Significant Differences issued in 1993 (1993 ESD), and the remedial action which will be implemented at the Site. (The 1988 ROD and the 1993 ESD are collectively referred to herein as the "ROD".) See Attachments 1 and 2.

Pursuant to Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), as amended, and pursuant to 40 C.F.R. 300.435 © (2) (I) (55 Fed. Reg. 8666, 8852 March 8, 1990) of the National Contingency Plan ("NCP"), EPA is required to publish an Explanation of Significant Differences ("ESD") when differences in the selected remedy "significantly change, but do not fundamentally alter the remedy selected in the ROD with respect to scope, performance, or cost." This ESD2 briefly describes the Site's location and history, summarizes the remedy selected in the ROD, describes the differences between the proposed changes and the ROD, and explains the basis for the changes.

This ESD2 explains changes in certain remedial action details pertaining to the return of the treated water to the aquifer as described in the ROD. The groundwater remedy selected in the ROD consists of a conventional pump-and-treat system which would return the treated water to the aquifer via reinjection wells. EPA proposes to modify the remedy by using percolation ponds to return the treated water to the aquifer. All other aspects of the selected groundwater remedy are as described in the ROD, including the scope and the cleanup standards.

This ESD2 and the supporting documentation will become part of the Selma Pressure Treating Administrative Record. A copy of the Administrative Record has been placed at the following locations:

Fresno County Library
Selma Branch
2200 Selma Ave.

Selma, CA 93662
(209) 896-3393

U.S. EPA Region IX
Superfund Records Center
75 Hawthorne Street
San Francisco, CA 94105
(415) 536-2000

II. Site Description and History

Located in Fresno County, California, the Site is approximately 15 miles south of the City of Fresno and adjacent to the southern city limits of Selma. The Site is comprised of approximately 18 acres which include a 4-acre wood treatment facility and 14 acres of vineyards that were used for site drainage. The Site is located in a transition zone between agricultural, residential, and industrial areas. Twelve (12) residences and/or businesses are located within 1/4 mile of the site. As of November 1996, a small transmission repair business leases an open air garage within 200 feet of the abandoned wood treatment facility. See Figure 1.

The wood preserving process originally employed at the site involved dipping wood into a mixture of pentachlorophenol ("PCP") and oil, then drying the wood in open racks to let the excess liquid drip off. In 1965, the wood treating operator converted to a pressure treating process which consisted of conditioning the wood and impregnating it with chemical preservatives. Chemical preservatives known to have been used at the Site include fluor-chromium-arsenate-phenol, chromated copper arsenate, PCP, copper-8-quinolinolate, LST concentrate, and Woodtox 140 RTU and Heavy Oil Penta 5% Solution. Prior to 1982, discharge practices for wastes generated from spent retort fluids and sludges included: 1) runoff into drainage and percolation ditches; 2) drainage into dry wells; 3) spillage onto open ground; 4) placement into an unlined pond and a sludge pit; and 5) discharges to the adjacent vineyards. Wood treating operations ceased in February 1994.

From 1971 to 1981, the Regional Water Quality Control Board ("RWQCB") regulated the discharges from the facility pursuant to a Waste Discharge Requirements Order. In January 1981, EPA, the RWQCB, and the predecessor to the California Department of Toxic Substance Control ("DTSC"), the Department of Health Services ("DHS"), conducted an investigation in accordance with Section 3007 of the Resource Conservation and Recovery Act which raised concerns regarding potential groundwater contamination at the Site. In September 1983, the Site was placed on the National Priorities List.

From 1981 to 1984, the RWQCB and DHS employed various enforcement tools in an attempt to force the owners and/or operators to conduct response actions at the

Site. In April 1984, DHS referred the Site to EPA for further action. EPA issued Unilateral Administrative Orders ("UAOs") to the owners and/or operators of the Site to conduct the work. The potentially responsible parties declined to comply with the UAOs based upon an inability to fund the work.

In 1988, EPA issued a final Remedial Investigation and Feasibility Study which characterized the soil and groundwater contamination at, and developed cleanup standards for, the Site. In September 1988, EPA signed the 1988 ROD which, in relevant part, identified chromium as the only significant contaminant in the groundwater. Sampling results during the remedial investigation indicated that a plume of chromium contamination extends downgradient from the Site to the southwest, with the southern boundary of the plume approximately 1700 feet southwest of the facility.

Groundwater investigations conducted by EPA after the issuance of the 1988 ROD provided a more complete picture of the extent of contamination and the pumping characteristics of the aquifer. Among other things, EPA's additional investigations revealed that the groundwater table had dropped to elevations below the point where EPA's original investigation had found the highest concentrations of chromium. Sampling and analysis of the groundwater before the 1988 ROD had suggested that PCP might be present in concentrations exceeding the then-newly promulgated, more stringent drinking water maximum contaminant level ("MCL") of 1 part per billion ("ppb"). Based upon its recent groundwater monitoring studies, EPA has determined that any concentrations of PCP in groundwater are below the current MCL of 1 ppb, and that chromium is the only groundwater contaminant present in concentrations which exceed the MCL of 50 ppb.

The 1988 ROD selected a groundwater remedy which would employ a conventional precipitation, coagulation, and flocculation extraction and treatment process, with either reinjection or off-site disposal of the treated effluent. The 1988 ROD established the cleanup standard for chromium to be 50 ppb.

In 1993, EPA issued the 1993 ESD which, among other things clarified language in the 1988 ROD and explained certain changes to the selected groundwater remedy. In relevant part, the 1993 ESD: 1) changed the term "cleanup goal" to "cleanup standard" wherever it was used in the 1988 ROD; 2) set the cleanup standard for PCP in groundwater at 1 ppb to comply with a new more stringent drinking water MCL (initially the 1988 ROD did not establish a cleanup standard for PCP because the California State action level of 30 ppm, which was considered a guideline, substantially exceeded the concentrations detected in the groundwater); and 3) modified the implementation of the groundwater extraction and reinjection system to reflect a more phased, observational approach for the siting and design of the wells.

III. <u>Description of Significant Differences and the Basis for Those Differences</u>

Based on reconsideration of certain technical information during the design phase and additional data gathered pursuant to the ROD, this ESD2 changes the manner in which treated water will be returned to the aquifer.

During the design phase, DTSC contended that there was insufficient data to sufficiently predict the impact to the aquifer from reinjection of treated water. Subsequently, EPA re-evaluated the groundwater treatment system and relevant data and was concerned that the treated water, if recharged to the aquifer via reinjection, might cause the plume of chromium concentration to spread laterally and/or vertically. An added concern was that the change in hydrology attributed to reinjection of water around the boundary of the plume could cause a loss of capture and reduce plume containment, thereby allowing the plume to spread into new areas. Based on the foregoing, EPA considered percolation as an alternative to reinjection because percolation more closely mimics natural aquifer recharge, and thereby reduces the risk of creating unwanted subterranean water movement or displacement of the contaminated plume. Off-site disposal of the effluent to the irrigation district was also considered, but this method was rejected because the irrigation district did not want the water during the rainy season.

Additional data and review of the design for the groundwater remedy indicated that percolation would be a preferable method for returning treated groundwater to the aquifer. Pursuant to the ROD, EPA gathered additional field data using observation wells and conducted a series of pilot percolation tests. The pilot percolation tests primarily tested the hydraulic conductivity and measures the infiltration rates in the subsurface soil. The results indicate that the infiltration rates are high enough to allow for successful recharge of the treated groundwater to occur by percolation. The results also indicate that returning the treated water to the aquifer via percolation would minimize the effect on the underlying aquifer and plume of contamination. Based on the foregoing, EPA determined that the Site conditions favor using a percolation pond to recharge the aquifer. See Attachment 3.

Additional benefits are associated with opting for percolation versus reinjection. First, the costs for construction and operation and maintenance of the percolation ponds would be less than such costs associated with reinjection. The higher cost to construct the reinjection system is attributable to the need to drill and develop eight wells and a network of piping to connect these wells to the groundwater treatment plant. The greater operation and maintenance costs for the reinjection system arise from the cost of energy to pump water into the wells, the cost of increased maintenance associated with the more extensive piping network, and the closure or removal of the wells. In contrast, percolation ponds employ a simpler technology which would not require additional wells or a pumping system, and would use a less extensive piping system, resulting in lower costs. See Attachment 4.

Second, employing percolation ponds would confine the recharge system to the Site, while the reinjection system requires that two wells and the associated piping be placed off-Site on neighboring properties. The reinjection system would require individual access agreements for each of the neighboring parcels affected and added security to oversee the off-Site system, in addition to coordination to minimize the disturbances to the neighboring agricultural operations. Construction of the reinjection system with eight new wells, six on-Site and two off-Site, would have a larger, more lasting impact than the percolation system.

In light of the factors discussed above, EPA has determined that a percolation pond recharge system is the preferred method for returning treated effluent to the aquifer at this Site. DTSC has also accepted the concept of percolation over reinjection for this Site. Such change will be implemented by a percolation system which will discharge treated effluent into two percolation ponds. The dimensions of each pond are two hundred feet by two hundred sixty feet (200'x260'). The ponds will be located approximately four hundred feet east of the western site border, and two hundred to four hundred south of the northern site border. See Figure 2.

The changes proposed in this ESD2 herein do not fundamentally alter the basic features of the groundwater remedy with respect to scope, cost, or performance (40 CFR 300.435(c)(2)(ii)). The overall remedial approach to groundwater remains extraction and treatment using conventional precipitation to remove the contaminant of concern, chromium.

IV. Support Agency Comments

California DTSC has reviewed, and concurred on, the draft of this ESD2 before it was sent out for public review.

V. Affirmation of the Statutory Determinations

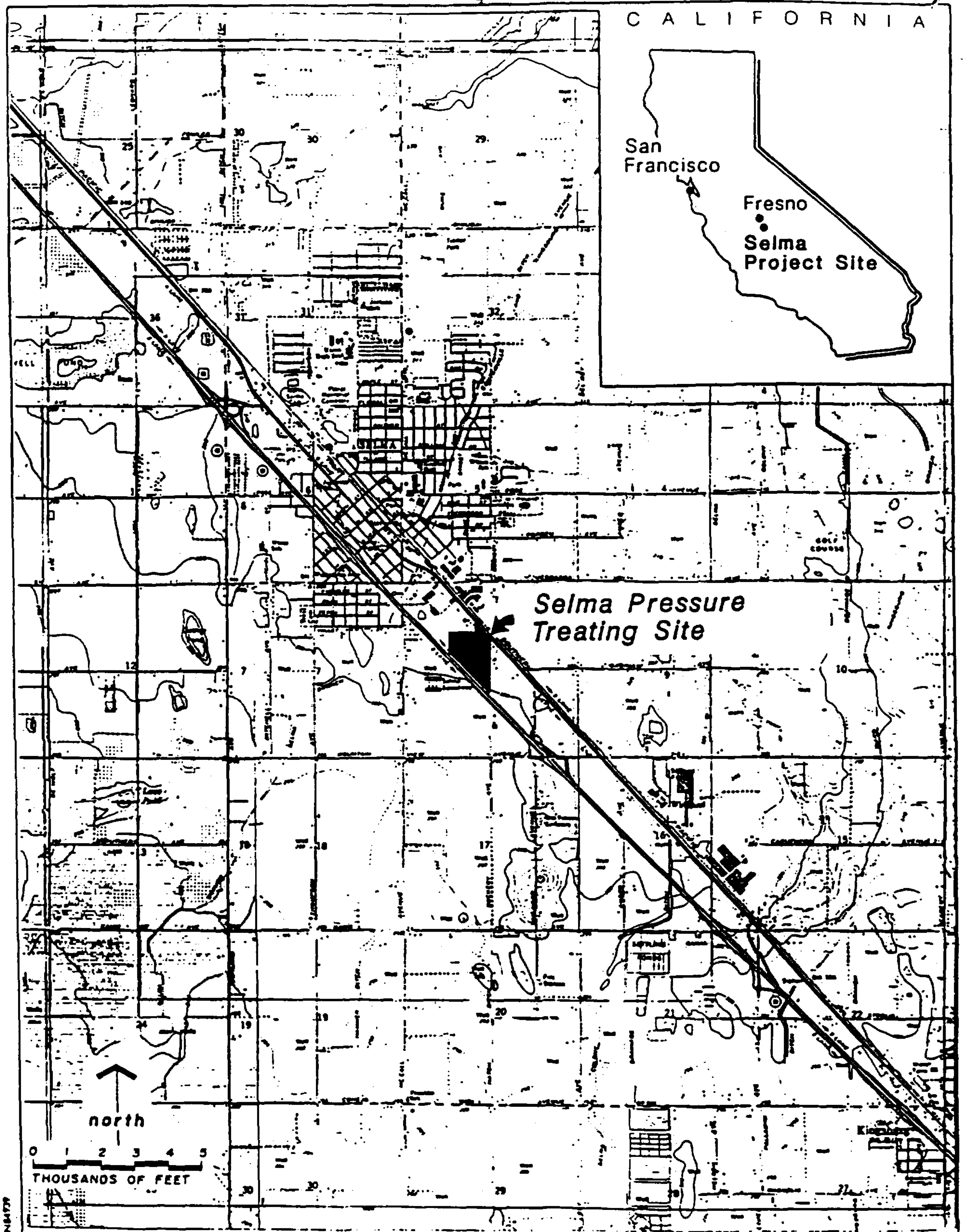
This selected remedy remains protective of human health and the environment, and continues to comply with applicable or relevant and appropriate federal and state requirements that were identified in the 1988 ROD, the 1993 ESD, and this ESD2. The selected remedy also remains cost-effective and continues to use permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site. Finally, the selected remedy continues to employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes.

VI. Public Participation

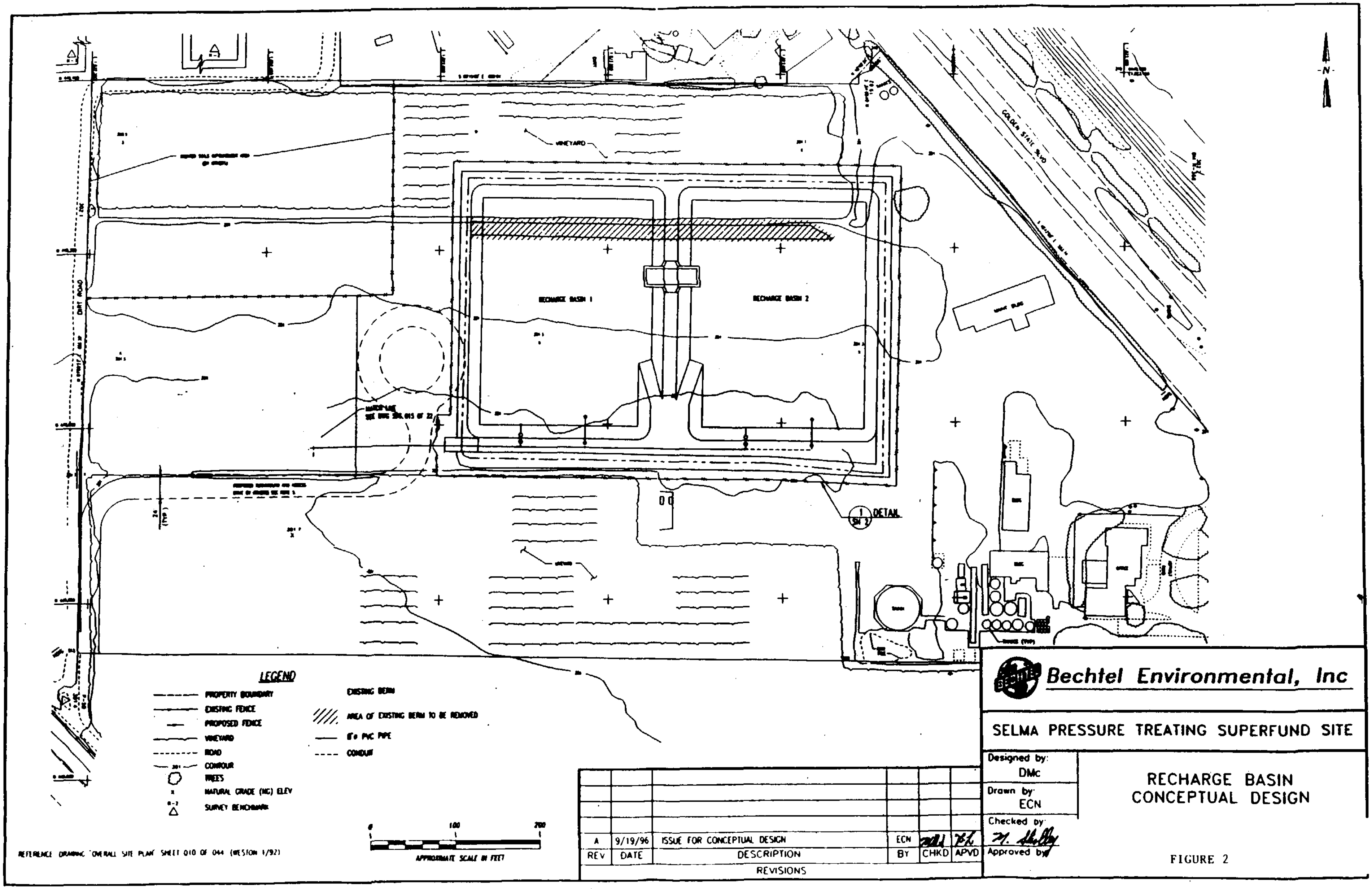
While neither CERCLA nor the NCP requires EPA to provide a period for public comment in connection with this Explanation of Significant Differences, in light of community interest in future land use, EPA intends to provide a period to allow for the public to comment on the changes discussed herein.

A public notice fact sheet describing this Explanation of Significant Differences was distributed to people listed as interested community members for the Selma Site as of April 23, 1997. The fact sheet summarized the changes proposed in the draft ESD2, identified the repository in Selma where the entire text of the draft ESD2 could be reviewed and provided a period for public comments from April 24 to May 23, 1997.

FIGURES



Project No.	Selma Pressure Treating Site	FIGURE 1
123-RI1	Camp Dresser & McKee Inc.	



GOLDEN STATE BLVD
VINEYARD
RECHARGE BASIN 1
RECHARGE BASIN 2
DIRT ROAD
DETAIL
LEGEND
PROPERTY BOUNDARY
EXISTING FENCE
PROPOSED FENCE
VINEYARD
ROAD
CONTOUR
TREES
NATURAL GRADE (NG) ELEV
SURVEY BENCHMARK
EXISTING BERM
AREA OF EXISTING BERM TO BE REMOVED
8" PVC PIPE
CONDUIT
0
100
200
APPROXIMATE SCALE IN FEET
REFERENCE DRAWING "OVERALL SITE PLAN" SHEET 010 OF 044 (WESTON 1/92)
Bechtel Environmental, Inc
SELMA PRESSURE TREATING SUPERFUND SITE
Designed by: DMc
Drawn by: ECN
Checked by:
Approved by:
RECHARGE BASIN CONCEPTUAL DESIGN
FIGURE 2
A
9/19/96
ISSUE FOR CONCEPTUAL DESIGN
ECN
REV
DATE
DESCRIPTION
BY
CHKD
APVD
REVISIONS

[redacted]

ATTACHMENT 1

RECORD OF DECISION
FOR THE
SELMA PRESSURE TREATING COMPANY
SUPERFUND SITE

PREPARED BY

THE U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION IX

SAN FRANCISCO, CALIFORNIA

SEPTEMBER, 1988

TABLE OF CONTENTS
SELMA RECORD OF DECISION

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

The Selma Pressure Treating Company (SPT) site is located in Selma, California, 15 miles south of the City of Fresno, in California's Central Valley.

STATEMENT OF BASIS AND PURPOSE

This decision document represents the selected remedial action for the Selma Pressure Treating site, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, and the National Contingency Plan. This decision is based on the administrative record for this site. (The attached index identifies the items which comprise the administrative record upon which the selection of the remedial action is based). The State of California has concurred on the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

This Record of Decision (ROD) for the Selma Pressure Treating site includes the following actions to address contaminated soil and groundwater for the entire site (there are no operable units):

- Conventional water treatment to remove chromium from the groundwater, including:
  - Extraction of contaminated groundwater
  - Treatment of contaminated groundwater using precipitation, coagulation, and flocculation processes to remove chromium to meet the applicable drinking water standard
  - Disposal of treated and tested groundwater by reinjection into the aquifer or off-site disposal, as appropriate
  - Groundwater monitoring to verify contaminant clean-up
- Soil fixation with a Resource Conservation and Recovery Act (RCRA) Cap to treat contaminated soil, including:
  - Excavation of contaminated soils exceeding cleanup goals
  - Mixing soils with a fixative agent to solidify and stabilize contaminated soil
  - Replacement of fixed soil into excavated areas and covering the fixed areas with a RCRA Cap

- Long term monitoring of fixed soils for a period of approximately 30 years
- Long-term access and land use restrictions for fixed areas and short-term institutional controls to prevent use of contaminated groundwater until remediation is complete

DECLARATION

The selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate to this remedial action and is cost-effective. The groundwater remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions to the maximum extent practicable. The soil fixation/RCRA Cap element of this remedy is not considered fully permanent, due to the need for long-term monitoring. It does employ treatment that significantly reduces mobility as a principal element. However, toxicity is not reduced and volume is increased due to addition of the fixative agent.

Because this remedy will result in hazardous substances remaining on the site, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The State's letter of concurrence is attached.

David W. McGovern — 9·24·88

Daniel W. McGovern — Date
Regional Administrator

DECISION SUMMARY

I. SITE NAME, DESCRIPTION, AND LOCATION

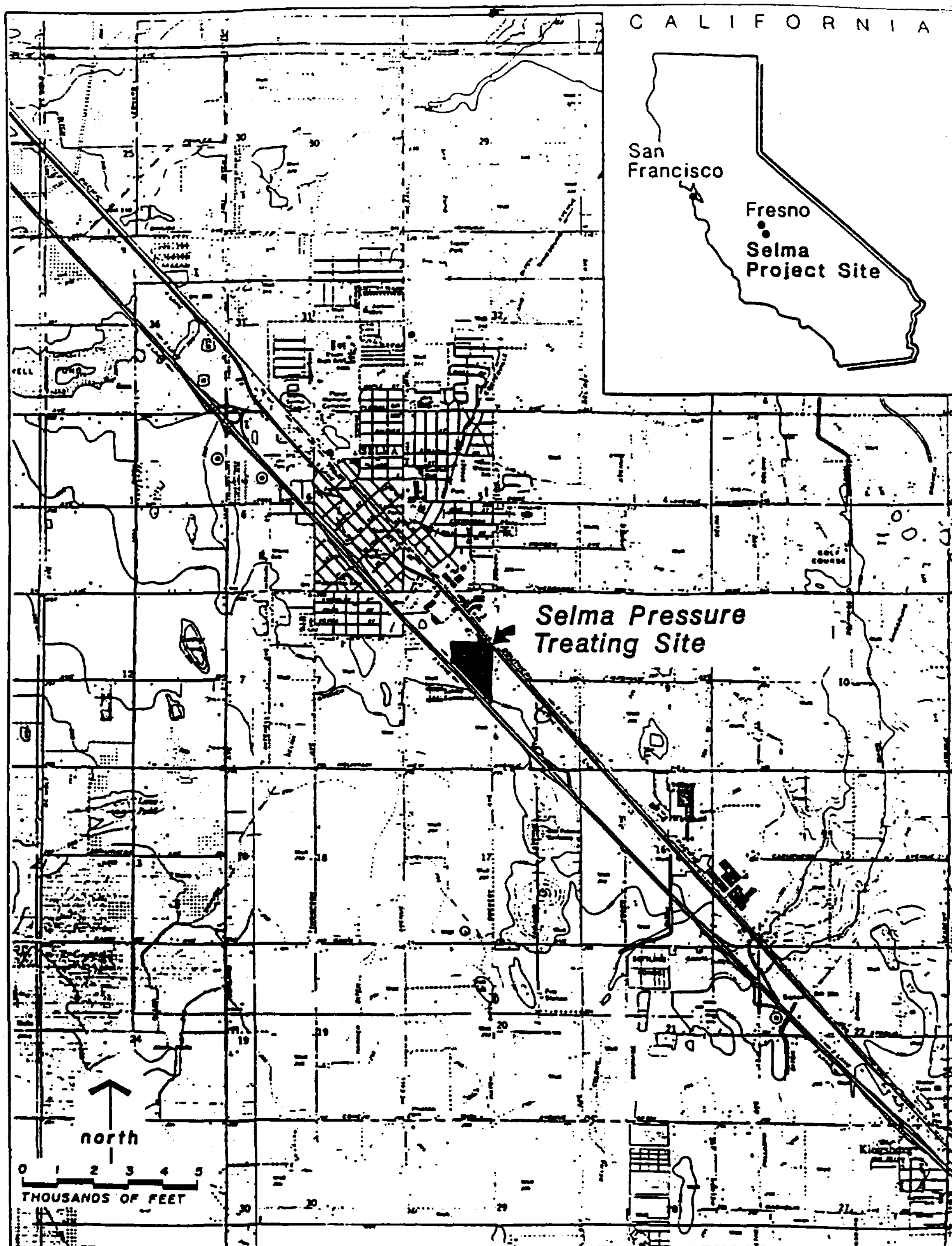
The SPT site is located about 15 miles south of Fresno and adjacent to the southern city limits of Selma (Figure 1). Dockery Avenue and Golden State Boulevard (old Highway 99) mark the entrance to the site. The SPT site comprises approximately 18 acres, including a 3-4 acre wood treatment facility and 14 acres of adjacent vineyards that were used for site drainage.

Zoned for heavy industrial use, SPT is located in a transition zone between agricultural, residential, and industrial areas. Situated in the center of the San Joaquin Valley, the area contains many vineyards, and Selma is labeled the "Raisin Capital of the World." Urban residential areas lie to the north, and scattered suburban dwellings surround the site. Approximately 12 residences and/or businesses are located within 1/4 mile of the SPT site. Currently, a wood treating facility, Selma Treating Company (STC), is operating at the SPT site. STC is owned by Saw Mill Properties, Inc. STC operations are regulated by state Waste Discharge Requirements Order No. 78-171, which precludes discharges to areas having hydraulic continuity with groundwater. At the time STC began operating, the Regional Water Quality Control Board (RWQCB) required installation of drip pads, berms around the site, and runoff containment to prevent ongoing contamination.

The Consolidated Irrigation District provides the majority of the irrigation supply in the area. The surface water irrigation supply is supplemented by groundwater resources in the vicinity of the site. The groundwater resources also supply the necessary domestic water for the surrounding communities and the scattered county residences. The regional groundwater gradient in the vicinity of the site is to the southwest. The groundwater resources in the area of the SPT site have been classified as a Sole-Source Aquifer by the U.S. Environmental Protection Agency, under the Safe Drinking Water Act, 42 U.S.C. §1424(e). Under EPA's Groundwater Protection Strategy (1984), the aquifer in the SPT area has been classified as a Class II A current drinking water source with other beneficial uses.

No other significant natural resources were found at SPT, such as federal or state rare, threatened, or endangered species, or wetlands. The site is not included on the National Register of Historic Places under the Historic Preservation Act of 1966, 16 U.S.C. §470 et seq.

The climate for the site consists of hot summers and mild winters. The maximum temperatures are generally around 100°F in July, with a minimum temperature of 35° in January.



Project No.	Selma Pressure Treating Site	REGIONAL LOCATION MAP	Figure
123-RI1	Camp Dresser & McKee Inc.		1

Average annual precipitation in the area is less than 10 inches. The monthly evaporation losses range from two inches per month during the winter to 18 inches per month during the summer.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Treatment of lumber products has been ongoing at the SPT site since 1942. The original wood treatment facility covered approximately 3-1/2 acres. In 1961, the treatment operation was taken over by Gerald Petery, the son of the original owner, and his wife, Mary Ann Petery (now Schuessler). A summary of the operating history of the Potential Responsible Parties (PRP's) is as follows:

Dates	Owners
1961-1/1970	Gerald Petery and Mary Ann Petery operated the facility as individuals.
1/1970-12/1977	Gerald Petery and Mary Ann Petery incorporated as Selma Pressure Treating Company, which was responsible for operating the facility.
1971-Present	Selma Leasing Company (SLC) was organized and owned by Gerald Petery. SLC became the owner of the land upon which SPT, and later Saw Mill Properties, Inc., operated.
12/1977-late/1981	Gerald Petery sold his interest in SPT to Mary Ann Schuessler (formerly Petery). Mary Ann Schuessler became the sole owner, president, and operator of SPT.
4/1981	SPT filed for bankruptcy and First Interstate Bank or a trustee took over the operation.
2/1982	SPT's trustee sold wood treating assets to Saw Mill Properties, Inc.
2/1982-Present	Saw Mill Properties, Inc. has operated the facility, as Selma Treating Company.

The wood-preserving process originally employed at the site involved dipping wood into a mixture of pentachlorophenol and oil, and then drying the wood in open racks to let the excess liquid drip off. A new facility was constructed in 1965, and SPT converted to a pressure treating process which consisted of conditioning the wood and then impregnating it with chemical preservatives.

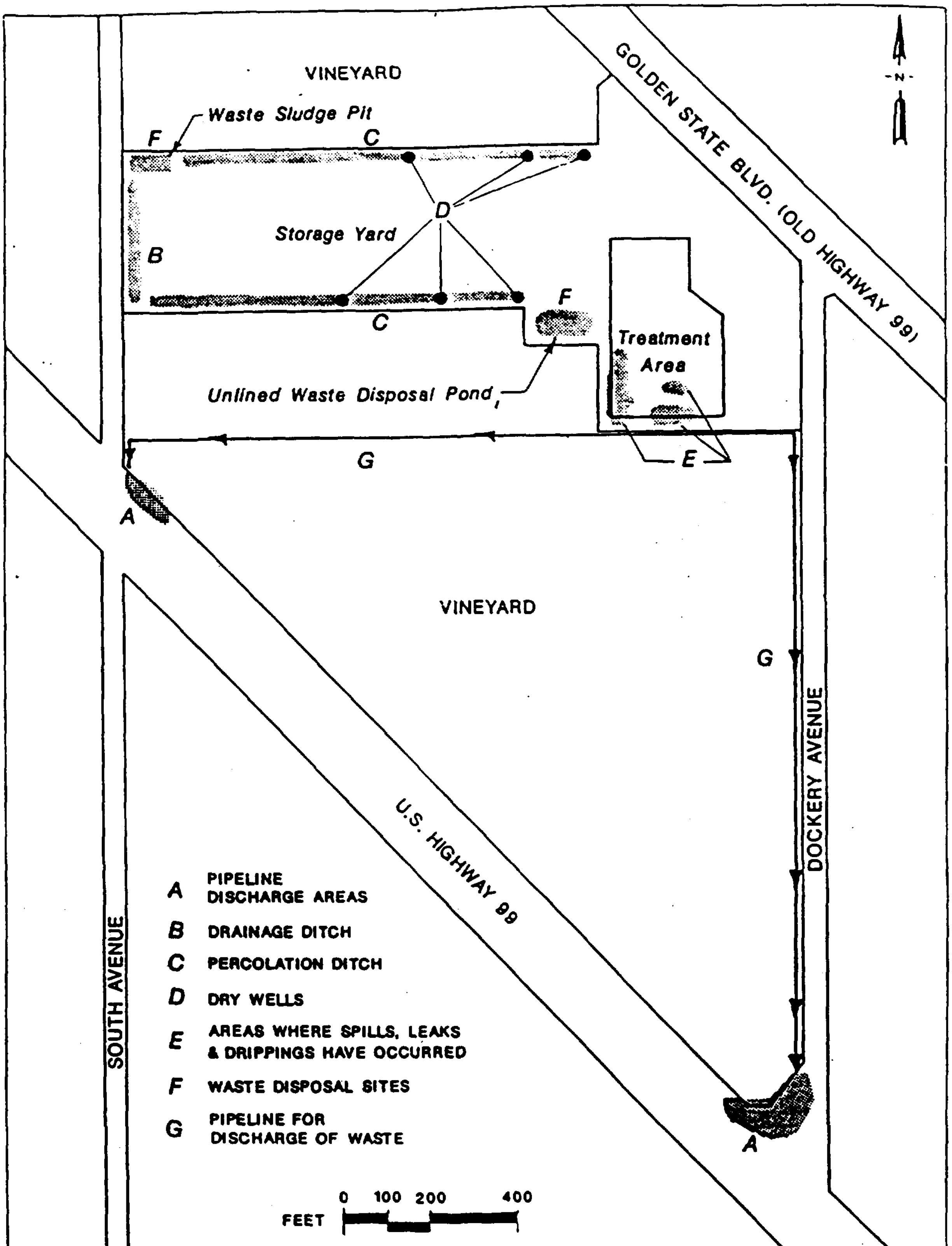
Prior to 1982, discharge practices included: (1) runoff into drainage and percolation ditches, (2) drainage into dry wells, (3) spillage onto open ground, (4) placement into an unlined pond and sludge pit, and (5) discharges to the adjacent vineyards. These wastes were generated from spent retort fluids and sludges. Figure 2 depicts these disposal sites.

Between 1971 and 1981, the Regional Water Quality Control Board (RWQCB) regulated the discharges from SPT, under a Waste Discharge Requirements Order. An Uncontrolled Hazardous Site Investigation was conducted on January 31, 1981 in accordance with §3007 of the Resource Conservation and Recovery Act (RCRA), by the EPA's Field Investigation Team (FIT), the California Department of Health Services (DHS), and the RWQCB. This inspection raised concerns about the potential for groundwater contamination from the site. As a result, SPT was required to modify its operation to minimize the potential for contamination. Initial site investigation activities were then conducted by the state and EPA to assess contamination problems.

Between 1981 and 1984, RWQCB, EPA, and DHS pursued efforts to have SPT and, later, SLC investigate the site to determine the extent of contamination. In September of 1981, the RWQCB issued a Cleanup and Abatement Order to SPT, requiring a geotechnical investigation and establishing a timetable for cleanup. The timetable for cleanup was not submitted to the RWQCB and in September of 1984, the RWQCB referred the Order to the California Attorney General's office, for enforcement. The Attorney General's office is pursuing a case against SLC, SPT, Gerald Petery, and Mary Ann Schuessler, on behalf of itself and the RWQCB. Gerald Petery has filed a cross-claim against a number of parties, including Mary Ann Schuessler, various chemical manufacturers of PCP, EPA's consultant, CDM, First Interstate Bank, Koppers, and Osmose.

In September of 1983, DHS informed SPT of violations and transmitted an Order, Settlement Agreement, and Schedule of Compliance, including civil penalties of $75,000. In December of 1983, DHS found SLC's counter proposal to this Order to be unsatisfactory. DHS referred the site to EPA for further action in April of 1984.

In August of 1983, EPA ranked the site using the Hazardous Ranking System (HRS) 40 C.F.R. Part 300, Appendix A, as authorized under 42 U.S.C. §105(a)(8), to determine whether to include the site on the Superfund National Priorities List of hazardous waste sites. The HRS ranking for the site indicated that releases of hazardous substances from the site may present a danger to human health and the environment. Based on this information the site was placed on the Superfund National Priorities List of hazardous waste sites in September 1983. The HRS ranking was 43.83, and the site was listed as number 195.



Project No. 123-FS1	Selma Pressure Treating Site Camp Dresser & McKee Inc.	AREAS OF SUSPECTED CONTAMINATION	Figure -2-

DATAPRINT · N02780

In September 1984, EPA requested Camp Dresser & McKee Inc. (CDM), under their REM II contract, to prepare a Work Plan outlining the tasks required to prepare a Remedial Investigation and Feasibility Study (RI/FS) for the site. CDM submitted the Work Plan outlining the RI/FS activities to be conducted, on June 7, 1985. The various project plans required to support the field investigation activities were submitted in 1985 and 1986. Field activities were initiated in April 1986, and were conducted in various phases through August 1987. The final RI report (CDM, 1988) provides the results of those field activities. An Endangerment Assessment (EA) was prepared to assess risks to human health and the environment associated with the No Action Alternative (ICF, 1988). The FS report (CDM, 1988) analyzes alternatives based on data collected and analyzed during the RI investigation and based on the results of the EA.

Potentially Responsible Parties (PRPs) have not been involved in development of the RI/FS. EPA is currently in discussion with PRPs regarding the potential for their involvement in the Remedial Design/Remedial Action (RD/RA) phases of this project and for recovery of past costs. Special notice letters will be issued in the near future under §122(e) of CERCLA. PRPs identified include Gerald Petery, Mary Ann Schuessler, and First Interstate Bank.

At present, technical discussions with PRPs have been limited to formal comments on the FS/Proposed Plan and related meetings. This information is included in the responsiveness summary and is part of the administrative record.

III. COMMUNITY RELATIONS

The following is a summary of community relations activities conducted by EPA for the SPT site, in order to meet the requirements under Sections 113(k)(2)(i-v) and 117 of CERCLA.

Dates	Activities
March/April 1985	EPA community relations (CR) representatives conducted community assessment interviews with interested community members in the Selma area.
July 1985	EPA distributed a fact sheet announcing the commencement of RI/FS work, and describing the RI/FS activities to the community.
July 1985	EPA held a community meeting in Selma to explain RI/FS activities that EPA was undertaking and to respond to the community's questions and concerns.

January 1986	EPA finalized the Community Relations Plan detailing the community concerns as expressed in the July 1985 community assessment interviews and communitty meeting.
March 1986	EPA distributed a fact sheet describing the purpose and nature of the monitoring wells placed in the Selma area. EPA also distributed a Spanish translation of this fact sheet.
May 1986	EPA Community Relations Coordinator met informally with community members to listen to their concerns and to explain current site activities.
July 1987	EPA distributed well sampling results to interested community members.
April 1988	EPA distributed a fact sheet detailing the results of the RI.
June 1988	EPA distributed a fact sheet explaining the contents of the FS Report and announcing the upcoming public comment period and community meeting.
June 22, 1988	EPA held a community meeting to explain the FS Report and to receive public comment on EPA's Proposed Plan for addressing the soil and groundwater contamination at the SPT site.
September 1988	Notice of this ROD, or Final Plan, will be published and made available to the public before commencement of the remedial action.

IV. SITE CHARACTERISTICS

The following discussions address contamination problems for the entire SPT site; there are no operable units (i.e., sub-investigations) for this site. All data were validated by Region 9, EPA, using standard review protocols and data quality was considered in analysis of the data and in reaching the decision.

A. Surface And Subsurface Soil Results

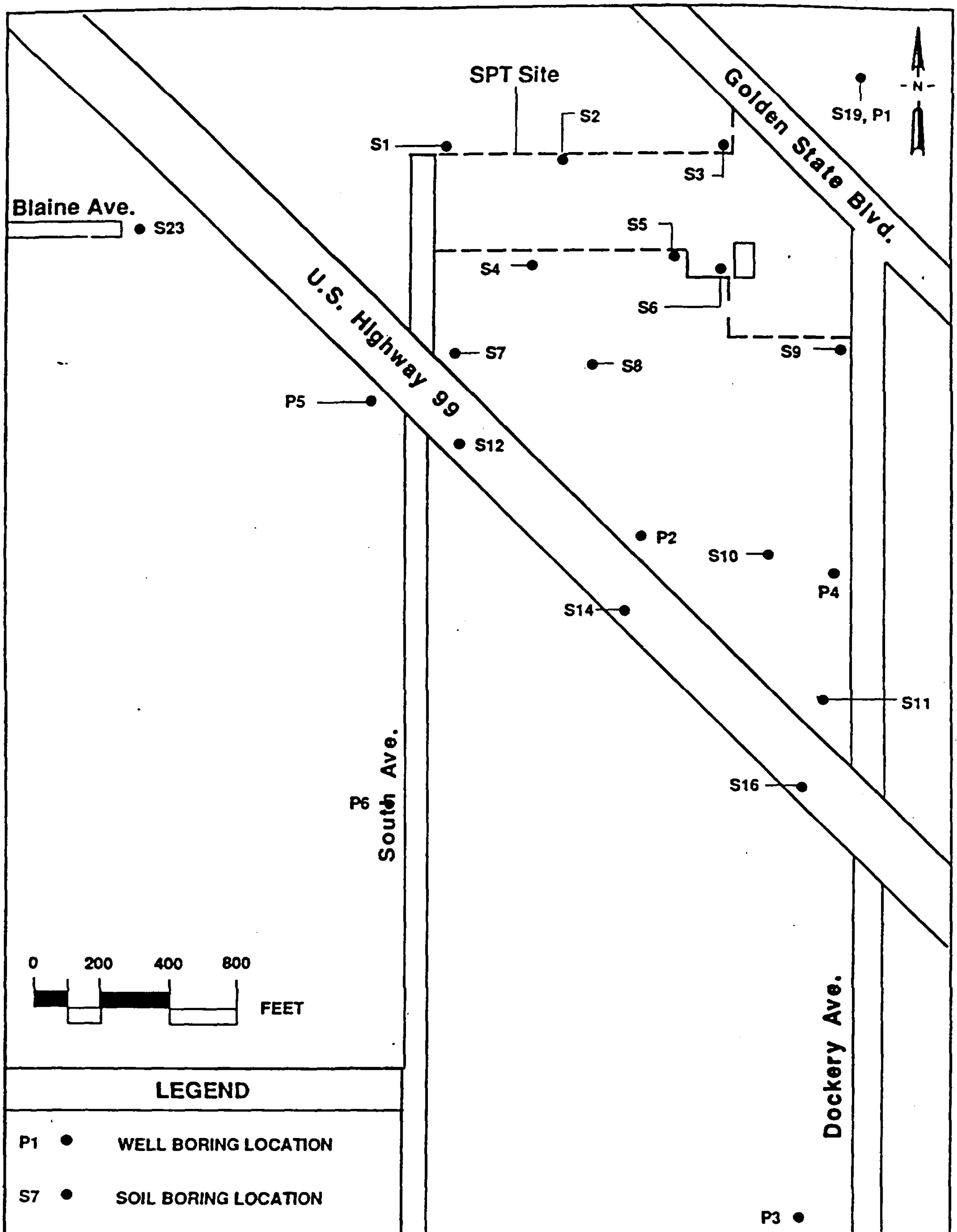
A total of 48 surface soil samples were collected during two rounds of sampling. The samples were collected from locations where waste was suspected to have been discharged, from known waste disposal areas, and from background locations. The samples were analyzed for a variety of constituents, including: An initial screening for Hazardous Substance List (HSL) volatiles, semi-volatiles and metals; hexavalent chromium; individual phenols; and dibenzodioxin/dibenzofuran (dioxin/furan) chlorinated tetra through octa homologs. A subsequent phase to confirm earlier results was performed and included analysis for isomer specific chlorinated dioxin/furans and metals. The site-related contaminants of concern found in surface soils included chromium, arsenic, copper, dioxin/furan, pentachlorophenol (PCP), and trichlorophenols (TCP).

A round of subsurface soil samples was collected at 21 boring locations during the RI field program (Figure 3). Samples were generally collected at the following depths: 1 to 2.5 feet (ft.), 2.5 to 4.0 ft., 4 to 5.5. ft., 10 to 11.5 ft., 15 to 16.5 ft., and 20 to 21.5 ft. (e.g. to the water table). The samples were analyzed for individual phenols, chromium, arsenic, and copper. Selected samples were also analyzed for the tetra through octa chlorinated dioxin/furan homologs, without identification of isomers. Chemicals of concern for the subsurface soils were the same as for the surface soils.

The soil sampling results identified seven areas where past practices resulted in levels of contamination above background concentrations that they warranted further evaluation. The seven soil contamination areas are the Waste Sludge Pit, North Unlined Percolation Ditch (Ditch A), South Unlined Percolation Ditch (Ditch B), Unlined Waste Disposal Pond, Drainage Area, Southeast Disposal Area, and Southwest Disposal Area. Table 1 provides the highest level for each of the contaminants of concern detected in each area of concern. Figure 4 identifies the location of each of the areas. The boundary of each area was based on the available sampling data and geographical features associated with each site.

These locations represent areas of concern due to the elevated levels of site-related contaminants detected at each of these sites. For example, high levels of arsenic, up to 4120 ppm, were detected at the Waste Sludge Pit. High levels of arsenic were also detected at the Unlined Waste Disposal Pond and Southeast Disposal Area. Elevated levels of dioxin/furan contamination, in tetra chlorinated dibenzodioxin (TCDD) equivalents, were detected at the former Unlined Waste Disposal Pond and the Southeast Disposal Area.

TCDD equivalents are a means of comparing the levels of dioxin/furan contamination in various locations. The toxicity of a particular dioxin/furan compound is



Project No. 123-FS1	Selma Pressure Treating Site / Camp Dresser & McKee	SUBSURFACE SOIL SAMPLING LOCATIONS	Figure 3

TABLE I MAXIMUM CONTAMINANT CONCENTRATIONS FOUND IN SOILS

Location	Arsenic mg/kg	Chromium mg/kg	Copper mg/kg	PCP µg/kg	Total[1] TCP µg/kg	Total[1] Dioxins ng/g	Total[1] Furans ng/g	TCDD[2] EQUV ng/g	Total TCDD ng/g	Total TCDF ng/g	Total PeCDD ng/g	Total PeCDF ng/g	Total HxCDD ng/g	Total HxCDF ng/g
Waste Sludge Pit (Sample Sites W04, S34-S38)														
- Surface	4120	3910	1870	11000	R	283.8	56.6	.29	ND	ND	ND	ND	3.4	6.8
Unlined Percolation Ditch A (Sample Sites S1, S2, S3)														
- Surface	55	196	121	2100	R	130.2	40.1	.31	ND	ND	ND	0.7	3.4	5.4
- 1 to 2.5 ft.	ND	13	14	32	277	63.2	11.5		ND	ND	ND	0.05	0.71	1.7
- 2.5 to 4 ft.	22	9.7	9.6	34.9	4.9	32.9	2.7		ND	ND	ND	ND	0.21	1.1
- 4 to 5.5 ft.	23	9	10	365	14	40.3	10.1		ND	ND	ND	ND	0.85	1.3
- 10 to 11.5 ft.	3.2	8	7.3	21.1	80	2.5	0.48		ND	ND	ND	ND	NA	0.061
- 15 to 16.5 ft.	3.5	11	12	ND	ND	NS	NS		NS	NS	NS	NS	NS	NS
- 20 to 21.5 ft.	ND	12	18	43	38	1.0	0.18		ND	ND	ND	ND	ND	ND
Unlined Percolation Ditch B (Sample Sites S4, S5)														
- Surface	ND	12	17	ND	ND	7	2.5	.01	ND	ND	ND	ND	ND	ND
- 1 to 2.5 ft.	3.7	15	11	ND	10	0.9	ND		ND	ND	ND	ND	ND	ND
- 2.5 to 4 ft.	12	23	10	23.1	ND	0.8	0.1		ND	ND	ND	ND	ND	0.21
- 4 to 5.5 ft.	6.3	19	12	340	ND	12.5	2.5		ND	ND	ND	ND	ND	0.28
- 10 to 11.5 ft.	5.3	11	18	11.4	13	0.2	ND		ND	ND	ND	ND	ND	NA
- 15 to 16.5 ft.	ND	13	8.3	26	ND	NS	NS		NS	NS	NS	NS	NS	NS
- 20 to 21.5 ft.	ND	12	12	ND	41	ND	ND		ND	ND	ND	ND	ND	ND
Unlined Waste Disposal Pond (Sample sites W03, S29 - S33)														
- Surface	850	879	553	460,000	R	1228.7	634	5.65	ND	ND	ND	11.9	117	232
Southwest Disposal Area (*Sample site S7*)														
- Surface	21	24	9	ND	ND	1253.7	361.9	.29	ND	0.12	ND	2.8	12.7	64.7
- 1 to 2.5 ft.	31	31	5.6	ND	3	621.3	119.7		ND	0.19	ND	1.0	7.3	24.6
- 2.5 to 4 ft.	25	15	ND	ND	ND	21.1	0.7		ND	ND	ND	ND	ND	0.11
- 4 to 5.5 ft.	28	11	ND	ND	ND	2.64	ND		ND	ND	ND	ND	ND	ND
- 10 to 11.5 ft.	9.9	8.9	6.3	ND	ND	1.7	ND		ND	ND	ND	ND	ND	ND
- 15 to 16.5 ft.	17	6.7	5.1	ND	ND	NS	NS		NS	NS	NS	NS	NS	NS
- 20 to 21.5 ft.	8.8	7	ND	234	8.0	0.1	ND		ND	ND	ND	ND	ND	ND

N/A Not Available
ND Not Detected
NS Not Sampled

R: Data Rejected during data validation

TCDD: Tetrachlorodibenzo-p-dioxins
TCDD EQUV: TCDD equivalents
TCDF: Tetrachlorodibenzofurans

PeCDF: Pentachlorodibenzofurans
HxCDD: Hexachlorodibenzo-p-dioxins
HxCDF: Hexachlorodibenzofuran
PeCDD: Pentachlorodibenzo-p-dioxins

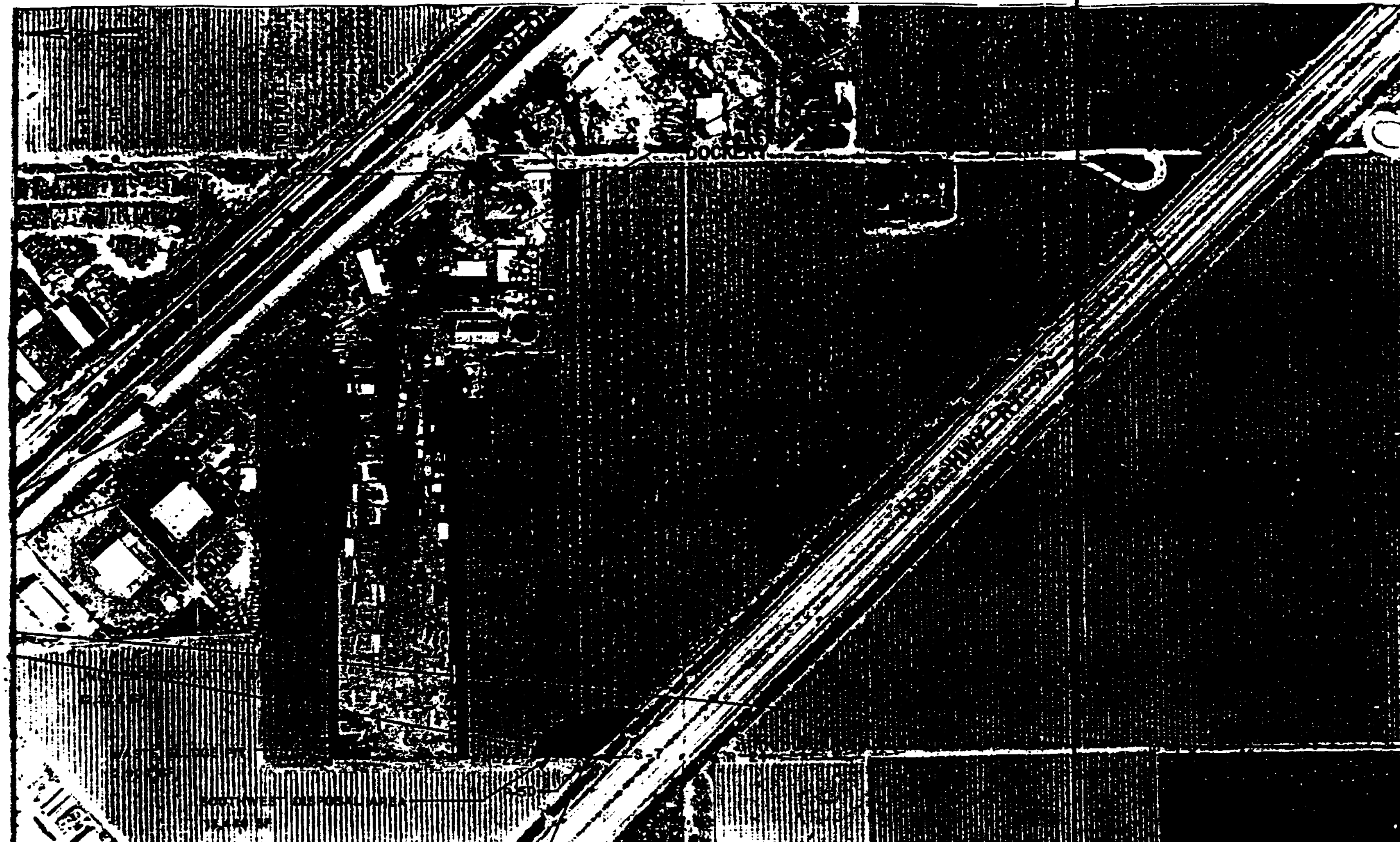
1 Total dioxin/furan analysis includes Tetra through Octa homologs, of which the Octa homolog is considered innocuous.
2 TCDD Equiv. are based on both the isomer specific and homolog data.

TABLE 1 MAXIMUM CONTAMINANT CONCENTRATIONS FOUND IN SOILS (continued)

Location	Arsenic mg/kg	Chromium mg/kg	Copper mg/kg	PCP µg/kg	Total[1] TCP µg/kg	Total[1] Dioxins ng/g	Total[1] Furans ng/g	TCDD[2] EQUV ng/g	Total TCDD ng/g	Total TCDF ng/g	Total PeCDD ng/g	Total PeCDF ng/g	Total HxCDD ng/g	Total HxCDF ng/g
Drainage Area (Sample site S9)														
- Surface	12.2	25	15	ND	ND	28.3	6.8	.03	ND	ND	ND	ND	0.38	0.64
- 1 to 2.5 ft.	5.0	21	7.7	ND	ND	0.5	0.1		ND	ND	ND	ND	ND	ND
- 2.5 to 4 ft.	14.0	14	17	ND	ND	13.2	2.0		ND	ND	ND	ND	0.052	0.16
- 4 to 5.5 ft.	13.0	10	12	ND	ND	11.4	.77		ND	ND	ND	ND	ND	ND
- 10 to 11.5 ft.	2.7	ND	9.2	ND	ND	0.6	ND		ND	ND	ND	ND	ND	ND
- 15 to 16.5 ft.	R	ND	7.4	ND	ND	NS	NS		NS	NS	NS	NS	NS	NS
- 20 to 21.5 ft.	1.4	7.1	13	ND	ND	0.3	ND		ND	ND	ND	ND	ND	ND
Southeast Disposal Area (Sample sites W05, S39 - S44)														
- Surface	467	390	422	200,000	92	2316.5	2214.2	1.62	ND	ND	ND	8.2	45	86.2

N/A Not Available
ND Not Detected
NS Not Sampled
R: Data Rejected during data validation
TCDD: Tetrachlorodibenzo-p-dioxins
TCDD EQUV: TCDD equivalents
TCDF: Tetrachlorodibenzofurans
PeCDF: Pentachlorodibenzofurans
HxCDD: Hexachlorodibenzo-p-dioxins
HxCDF: Hexachlorodibenzofuran
PeCDD: Pentachlorodibenzo-p-dioxins

[1] Total dioxin/furan analysis includes Tetra through Octa homologs, of which the Octa homolog is considered innocuous.
[2] TCDD Equiv. are based on both the isomer specific and homolog data.



LEGEND

● S-10 Soil Sampling Location

● P-4D Plume Tracking Monitoring Well Location

● R-23 Existing EPA Monitoring Well Location

Estimated Area of Soil Contamination, with Surface Area in Sq. Feet (SF)

AERIAL PHOTO BY METRO ENGINEERING VAN NUYS, CA JUNE 1987

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Project No.	Selma Pressure Treating Site	EXTENT OF SOIL CONTAMINATION	Figure
123-FS1	Camp Dresser & McKee		4

dependent upon the degree of chlorination at the 2,3,7,8, position. The exception to this is the octa chlorinated dioxin/furan homologs, which are considered innocuous. The remaining tetra through hepta isomers have various degrees of toxicity. In order to assess the potential toxicity associated with the dioxin data, each sample was evaluated with respect to 2,3,7,8 TCDD equivalents. This involves converting each dioxin/furan homolog into TCDD equivalents based on the EPA approved methodology using Toxicity Equivalent Factors (TEF).

Due to the lack of vertical extent data in source areas, an estimate of vertical extent of contamination was made to calculate volumes of soil requiring cleanup. The metal contamination in the soil was assumed to extend to a depth of 20 feet, which corresponds to the approximate depth of the water table. This assumption is based on the results of the groundwater sampling, which show elevated levels of chromium in the shallow portions of the aquifer. Dioxin/furan contamination is assumed to extend to 10 feet in depth based on available subsurface sampling results from various boring locations, which indicate that dioxin/furan contamination reaches permissible levels within the first 10 feet. This is evident from Table 1 which indicates that dioxin was detected in trace levels in only one soil sample taken from below 10 feet. Additional soil borings will be collected during RD/RA to refine this information on vertical extent of contamination.

The site-related surface and subsurface soil contaminants have variable mobilities in the environment. For example, dioxin/furan compounds have very low solubilities and are extremely immobile in the soil. Copper is also not very mobile in the environment due to its strong affinity for clays, hydrous metal oxides, and soil organic matter. Trivalent chromium has similar sorption characteristics to copper, and as such, tends not to be very mobile. Hexavalent chromium is very soluble and highly mobile in the environment. Furthermore, hexavalent chromium is not easily sorbed on the soil. However, hexavalent chromium is only stable under oxidizing conditions and will form trivalent chromium in a reducing environment. In regard to PCP and arsenic, these compounds can be relatively mobile under high pH environments. However, these compounds appear to be relatively immobile at the SPT site due to the general lack of observed levels in the groundwater.

B. Soil Clean-up Goals and Areas Requiring Remediation

Of the organic contaminants at SPT, the site-specific risk assessment indicated that dioxin/furan would drive the clean-up goals. The clean-up goal selected for dioxin/furan contaminated soil is 1.0 ng/g (ppb), in

TCDD equivalents. This clean-up goal is based on a TCDD risk study performed by Kimbrough, et al. (1984) of the Centers For Disease Control (CDC). This study is the basis for EPA policy and clean-up goals at Superfund sites where there is dioxin contamination. The 1 ppb goal is for areas where potential residential or agricultural uses could occur. While the SPT site is currently used for industrial purposes, the 1 ppb goal was selected due to the proximity of residences and agricultural activities to the site.

The heavy metals of concern at SPT are arsenic, chromium, and copper. Based on the health risk assessment, the metals clean-up goals were driven by arsenic. However, the primary basis for the metals clean-up goals will be the protection of groundwater. The selected 50 ppm arsenic goal assumes solubility and attenuation factors which are being verified by collecting more data. During remedial design (RD), data to evaluate the solubility of the soil contaminants and establish a site-specific attentation factor may indicate that both the arsenic and chromium clean-up goals need to be modified in order to provide adequate protection of the groundwater. A modification in the clean-up goals could result in a change in the volume of soil requiring remediation.

The 50 ppm arsenic goal is protective of all direct contact scenarios except new, on-site residential development. Institutional controls are required to prevent on-site residential development.

As stated previously, seven areas of contaminated soil were identified at SPT (see Figure 4). The clean-up goals indicate that four of these areas require remediation. The four areas proposed for clean-up are the Waste Sludge Pit, the Unlined Percolation Ditch A, the Unlined Waste Disposal Pond, and the Southeast Disposal Area.

Sampling results for three other areas indicate that contamination levels are below clean-up goals. These three areas are the Unlined Percolation Ditch B, the Drainage Area, and the Southwest Disposal Area.

C. Groundwater Results

The hydrogeologic setting for the area consists of valley-fill sequence due to the deposition of sediments from the adjacent Sierra-Nevada highlands. The depositional environment results in discontinuous geologic units. The exception to the discontinuous nature of the units is a five to ten foot clay layer located at a depth of approximately 55 to 60 feet below ground surface, which appears to be continuous or semicontinuous across the site. Additional data will be collected during remedial design to verify the continuity of the clay layer. The groundwater directly underlying the site is an unconfined aquifer.

Three rounds of groundwater samples were conducted in the vicinity of the SPT site. The first round of sampling occurred in April-May 1986 and included several regional domestic and irrigation wells, as well as five existing EPA monitoring wells installed by the EPA Environmental Response Team (ERT). The second round of sampling was performed in February-March 1987. This round included the sampling of the five existing EPA monitoring wells and the ten newly installed plume tracking monitoring wells. A third round of sampling occurred in July-August 1987 and included all of the monitoring wells and selected regional wells. The analyses performed for each round were as follows:

1. First Round, April-May 1986:

   Individual phenols (Method 604)
   Routine Analytical Services (RAS) Metals
   General water quality parameters

2. Second Round, February-March 1987:

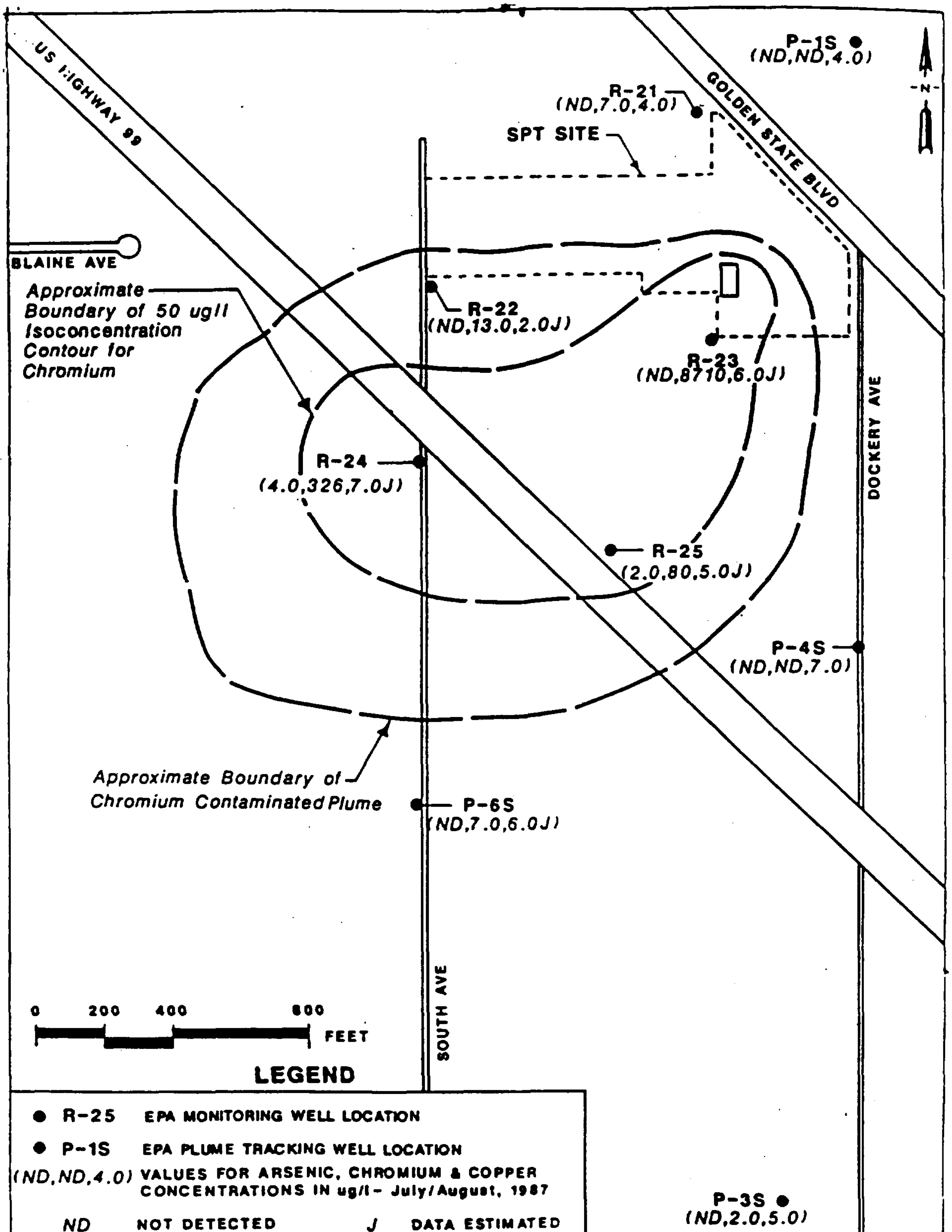
   Individual phenols (Method 604)
   RAS Metals
   General water quality parameters

3. Third Round, July-August 1987:

   Individual phenols (Method 604) - all wells
   Dissolved chromium, arsenic, copper - all wells
   Target Compound List (TCL) Volatiles - existing EPA and plume tracking monitoring wells
   TCL Semivolatiles - existing EPA and plume tracking wells
   Dioxin/furan homologs - five existing EPA monitoring wells

While there are several contaminants at elevated levels in the soil, chromium was the only contaminant of significance detected in the groundwater, due to the relative immobility of dioxin/furan, arsenic, and copper. Organics (dioxin/furan and PCP) are being resampled as part of remedial design related activities, but previously detected levels are believed to be due to sampling errors.

Sampling results indicate that a chromium contaminated plume extends downgradient from the site to the southwest (Figure 5). The southern boundary of this plume appears to range approximately 1,200 feet south-southwest of the existing wood treatment facility boundary. The groundwater contamination is apparently confined to



Project No.	Selma Treating Company Site	GROUNDWATER PLUME BOUNDARY MAP	Figure
123-RI1	Camp Dresser & McKee Inc.		5

the shallower portion of the aquifer (to 40'), and does not currently affect any municipal, private, irrigation, or industrial wells in the vicinity, based on the sampling results. Contamination was not detected in the deep monitoring wells at depths of 87-100'. However, contamination levels in the intermediate portions (40-60') of the aquifer have not yet been defined.

The extent of the chromium contaminated plume needs additional definition to the west and southwest of well R24. As part of remedial design, two well nests west and south of R-24 are planned. A well nest will consist of one shallow well (40') and one intermediate well (60').

Additional definition of the vertical extent of contamination within the groundwater plume is also planned as part of remedial design. Three intermediate level wells completed at depths of 60 feet will be paired with the existing shallow wells in this area.

Additional data will also be collected on the continuity of the clay layer present at a depth of 55 to 60 feet. This data will be collected during the monitoring well installation program described above.

Other monitoring well installation plans include a shallow monitoring well (40') downgradient of the Southeast Disposal Area, and an intermediate level monitoring well and two observation wells in the upgradient background area. Other groundwater characterization activities to be conducted as part of remedial design include:

1. Monthly water level measurements for one year
2. Quarterly water quality sampling for one year
3. Long-term aquifer testing
4. Efforts to locate and sample the original Brown and Caldwell monitoring wells

Based on evaluation of the data collected from the above described activities, a decision will be made regarding the need for any additional characterization.

D. Groundwater Cleanup Goals

The groundwater cleanup goal is the Maximum Contaminant Level (MCL) established under both the federal and state Safe Drinking Water Acts. Due to the fact that chromium was the only contaminant of significance detected in the groundwater, additive effects were not of concern. Therefore, it was possible to select an ARAR as a clean-up goal, rather than a risk assessment driven goal.

Currently the MCL pertinent to SPT is the 50 ppb level set for chromium. The federal MCL is proposed for revision to 100 ppb, however, the state 50 ppb standard will probably be in effect at the time of remedial action. The most stringent of the state or federal MCL in effect at the time of RD/RA will be used. For analyses in the Feasibility Study and Record of Decision, the 50 ppb MCL was assumed. The arsenic MCL of 50 ppb, is also an applicable ARAR for the SPT site. However, arsenic was detected only at levels well below the existing or proposed MCL.

The boundary of the groundwater plume exceeding the chromium clean-up goal is delineated in Figure 5. This boundary was based on the elevated chromium values observed in the shallow monitoring and plume tracking wells. The western extent of contamination was estimated, based on the observed trend of the plume in other areas. The extent of contamination in this area will be further defined during the RD phase, through the installation of additional monitoring wells, as discussed in the preceeding section.

The data collected from the deep plume tracking wells in the site vicinity indicate that the chromium contamination at a depth of 90-120 feet does not exceed the chromium clean-up goal of 50 ppb. The exact vertical extent of contamination that exceeds the clean-up goal in the intermediate portions of the aquifer will be further defined as part of the RD, as described in the preceeding section.

V. SUMMARY OF SITE RISKS

A. Chemicals Of Concern

Data collected during the RI were reviewed to select a subset of chemicals (chemicals of concern) for detailed evaluation in the risk assessment. Separate subsets were selected for surface soils, subsurface soils (soil borings), and groundwater, in order to reflect the different exposure pathways associated with these different media.

A comparison of on-site and background levels of metals in surface soils, reveals that only arsenic, chromium, and copper appeared at elevated levels above background. Therefore these site-related chemicals were selected as chemicals of concern in surface soil, from among the metals. The organics of concern in the surface soil, identified in the risk assessment, were phenols, dioxins, furans, bis(2-ethylhexyl) phthalate, and di-n-butylphthalate. An analysis of subsurface soils produces the same subset of chemicals of concern, except that the phthalates were not included. The levels of arsenic and dioxin/furan contamination in the soil were the only constituents exceeding the health based clean-up goals.

Groundwater samples were collected from domestic, industrial, municipal, and irrigation wells, and from fifteen monitoring wells. Site-related chemicals detected were arsenic, chromium, copper, pentachlorophenol, and two dioxin congeners. Based on considerations of toxicity, concentration, and relations to site activities, arsenic, chromium, copper, and the dioxins were selected as chemicals of concern. However, only chromium exceeded the clean-up goals in groundwater.

B. Exposure Pathways

Potential human exposure pathways at the SPT site include exposure to contaminated groundwater, exposure via direct contact with contaminated soil (including incidental ingestion), and inhalation of contaminated dust. Based on data from existing private and municipal wells, risks associated with current use of groundwater in the vicinity of the site were evaluated. Using estimates based on data from monitoring wells and groundwater modeling, potential future risks associated with use of local groundwater as a potable supply were also evaluated. For soil, the EA evaluated exposure of individuals working at the site or in the vicinity of the site, local residents, and trespassers. Direct contact (dermal absorption or inadvertent ingestion) and inhalation were the exposure routes used. A number of scenarios involving these types of exposure were examined. Finally, a number of scenarios examining the potential exposure of off-site receptors to contaminants present in windborne dust also were evaluated using an air dispersion model.

C. Toxicity Of Chemicals Of Concern

Both the carcinogenic and noncarcinogenic effects of chemicals of concern used in the EA analysis are presented below. Exposure to arsenic has been associated with an increased incidence of cancer in humans. Chromium has been associated with an increased incidence of lung cancer in humans exposed via inhalation, but has not been associated with an increased incidence of cancer when exposure occurs via ingestion. Bis(2-ethylehexyl)phthalate and 2,4,6 trichlorophenol are classified as probable human carcinogens based on evidence from animal carcinogenicity bioassays. Certain dioxins and furans are considered to be carcinogenic by EPA and are also toxic to the reproductive system and the immune system.

Exposure to chromium via ingestion is associated with non-carcinogenic toxcicity, including decreased water consumption, and at higher levels, gastrointestinal disturbances, liver damage, kidney damage, internal hemorrage, dermatitis, and respiratory problems. Many of these effects are thought to be due to chromium VI, not to chromium III. Exposure to copper, chlorophenol, cresols, di-n-butylphthalate, 2,4-dichlorophenol, 2,4-dinitrophenol, 2- and 4-nitrophenol, pentachlorophenol, and phenol have been associated with a variety of systemic, noncarcinogenic effects in humans or experimental animals.

D. Risk Characterization

A quantitative assessment of potential risks posed by contaminants in the vicinity of the SPT site was performed. The potential for endangerment of human health under a number of current-use and future-use exposure scenarios was evaluated. For each exposure scenario evaluated, two exposure cases, an average and a plausible maximum case, were considered. For the average exposure case, mean concentrations are used together with what are considered to be the most likely (though conservative) exposure conditions. For the plausible maximum case, the highest measured concentrations are used, together with high estimates of the range of potential exposure parameters relating to frequency and duration of exposure and quantity of contaminated media contact.

To summarize the risk assessment, carcinogenic risks at SPT may be associated with exposure to surface soil contaminants and airborne particulates under current use scenarios. Under future use scenarios, exposure to groundwater contamination may pose both a carcinogenic and noncarcinogenic risk. Risk results for both the current-use and future-use scenarios are discussed below. The risk numbers are presented for carcinogenic risks greater than 1 x 10^{-6} or where the Chronic Daily Intake (CDI) exceeded the Reference Dose (RfD) for noncarcinogenic risks. Generally, at SPT these risks are associated with the plausible maximum scenario, rather than the average case.

1. Current-use scenarios: Under current-use scenarios, exposure of workers and residents to surface soil contaminants in the adjacent vineyard, through dermal adsorption and incidental ingestion, and inhalation were considered a carcinogenic risk. The plausible maximum risk associated primarily with exposure to arsenic and dioxin/furans was 3 x 10^{-4}, or the risk of three excess cancer cases during a lifetime exposure of 10,000 individuals.

   The plausible maximum cancer risk from exposure of trespassers to surface soil contaminants at the wood treating facility was 2 x 10^{-5}. For workers, the average risk was 6 x 10^{-6} and the plausible maximum risk was risk was 4 x 10^{-3}. Again this risk is associated primarily with exposure to arsenic and dioxin/furans.

The plausible maximum risks due to inhalation of contaminated dust are associated primarily with exposure to arsenic and chromium. The risk ranges from 1 x 10^{-5} to 5 x 10^{-6} for locations 250 meters north and south of the site and 500 meters southeast of the site.

Under current-use conditions, groundwater as a potable supply is not expected to be a potential health concern, since the CDI is less than the RfD. This is based on exposure to chromium, which is a noncarcinogen by ingestion. The reason the current-use scenario has no risk is that no drinking water wells are currently within the groundwater plume boundaries. Institutional controls are needed to ensure that no wells are drilled into the contaminated area for drinking water purposes, until remediation is completed.

2. Future-use Scenarios: Under future use conditions, use of the shallow groundwater as a potable supply may be a potential health concern under the plausible maximum scenario, where the CDI levels for chromium could be 49 times greater than the RfD.

For the deep groundwater, risk assessment based on a mass balance model indicated that the CDIs for several of the noncarcinogenic contaminants of concern could exceed their corresponding RfDs under both the average and plausible maximum scenarios. This is due to the potential for future leaching of contaminants, such as chromium, out of the soil into the groundwater.

Under the mass balance model, excess cancer risks associated with exposure to carcinogenic contaminants (primarily background arsenic) was estimated to be 3 x 10^{-2}. However, arsenic is not expected to be highly mobile at SPT, based on observed levels in groundwater. The mixing model used to derive the risk number did not account for attenuation of contaminants in the environment and represents a very conservative estimate of the potential future risk associated with groundwater use. Because of this, arsenic was not retained as a chemical of concern in the formulation of groundwater remediation alternatives in the FS.

Under future use scenarios, direct contact with soil contaminants or inhalation of contaminated particulates over relatively short periods of time by on-site construction workers, are not expected to be a potential health concern. This is the case for exposed individuals under either average or plausible maximum cases.

E. Analytical Methods Used

The Endangerment Assessment for the SPT site generally followed the guidelines established by EPA for risk assessments under CERCLA (EPA 1985a, 1986a) and for health risk assessments in general (EPA 1986b,c,d). The purpose of the assessment was to evaluate the No Action Alternative. The assessment was based on data generated under the EPA contract laboratory program (CLP).

VI. DOCUMENTATION OF SIGNIFICANT CHANGES, Section 117(b)&(c) of CERCLA

The preferred alternative in the Proposed Plan is the same as the remedy selected in this ROD: Soil fixation with a RCRA cap and conventional groundwater treatment. No significant changes are proposed at this time. Additional data collection activities that will occur as part of remedial design could impact information contained in the ROD.

VII. DESCRIPTION OF ALTERNATIVES

A. Alternative 1 - No Action

This alternative involves taking no action to treat, contain, or remove the contaminated groundwater and soil. Multi-media monitoring would be performed every five years to support a reassessment of the No Action Alternative. The costs for this alternative are as follows:

Capital cost	$18,000
Operation and maintenance (O&M) cost (annual)	$22,000
Present worth (life of project at 8% discount and 4% inflation rates)	$90,000

B. Alternative 2 - RCRA Cap with Slurry Wall

Alternative 2 is a containment alternative. The function of the multi-layer RCRA Cap is to prevent direct contact with soil by humans and wildlife, and to minimize the potential for airborne contamination. In addition, the low permeability Cap reduces infiltration and leaching of contaminants from the soil into the groundwater. The Cap would be constructed over the areas of contaminated soil that exceed the cleanup goals. Approximately 33,300 square feet of Cap would be required to cover these areas, based on the current clean-up goals. The Cap would meet the RCRA closure requirements under

40 C.F.R. §264, Subparts F, G and N. An example of Cap construction according to EPA closure guidance would be:

1. A 2 foot clay layer with hydraulic conductivity no greater than 1×10^{-7} cm/sec.

2. A minimum 20 mil High Density Polyethylene (HDPE) geomembrane.

3. A one-foot sand layer with a hydraulic conductivity of 1×10^{-3} cm/sec and filter fabric.

4. A two foot top soil layer.

Capping does not eliminate the leaching of contaminants from the untreated waste left on-site. Fluctuating groundwater levels may cause groundwater contact with contaminated soils. This may result in additional contamination at levels above the MCL, particularly for chromium.

The groundwater component of this alternative is to install a slurry wall to isolate the contaminated groundwater from the uncontaminated portion of the aquifer. A 1,375 foot long wall would be keyed into a clay layer at a depth of 55 feet. Approximately 75 million gallons of contaminaated groundwater is estimated to need containment. Extraction wells would be placed inside the slurry wall to maintain the hydraulic gradient toward the contaminated groundwater being contained. Monitoring wells would be located downgradient and outside the slurry wall in order to evaluate the effectiveness of the wall over time. The risks of leaving contaminated groundwater in the aquifer would be potential exposure of users to water that does not meet the drinking water standards. Therefore, institutional controls to prevent such use are required.

The major limitation associated with the slurry wall is that the clay layer proposed for its base may not be thick or continuous enough to support the wall. Additional investigation of this clay layer would be needed to support this alternative.

The aquifer in the Selma area is currently classified under EPA's Groundwater Protection Strategy, as a Class II A aquifer, which is currently used for drinking water and other beneficial uses. Also, the Fresno area has a designated Sole Source Aquifer under the Safe Drinking Water Act, 42 U.S.C. §1424(e). Alternative 2 would not be consistent with protection of this groundwater resource, due to the continued exceedences of the MCL for chromium and the potential for continued leaching of chromium or other constituents from the soil.

Under Alternative 2, implementation requirements include obtaining permission for use of private property during Cap and slurry wall construction. The slurry wall would require permanent easements or private property acquisition along its alignment. Off-site treatment and disposal options for the extracted groundwater would need to be evaluated.

Long-term institutional controls would be implemented to prevent access by unathorized persons to the capped areas, including fencing, signs and other land use restrictions. Long-term access to capped areas, extraction wells, and monitoring wells would be needed by government officials or representatives to ensure O&M activities could occur. Finally, long-term institutional controls would be needed to prevent the use of the contaminated portions of the aquifer as a drinking water supply.

The implementation timeframe for Alternative 2 would be approximately two months for RCRA Cap construction and seven months for slurry wall construction, after property access agreements have been obtained.

Costs for Alternative 2 are as follows:

Capital:	$2,180,000
O&M:	$40,000
Present worth:	$2,390,000

C. <u>Alternative 3 - Soil Fixation with a RCRA Cap and Conventional Groundwater Treatment</u>

For soils, Alternative 3 has both treatment and containment components. The function of soil fixation, as treatment, is to create a monolithic soil matrix which inhibits leaching, using a stabilization and solidification process. The RCRA Cap, placed on top of the fixed soils would provide additional protection from surface disturbance and surface water infiltration. The waste to be treated is contained in the areas where the soil constituents exceed cleanup goals. Also, under this alternative, six dry wells will be evaluated and abandoned, as appropriate.

The arsenic and chromium contamination is considered a RCRA characteristic waste under 40 C.F.R. §261.24. The dioxin and PCP waste is considered a RCRA K001 listed waste under 40 C.F.R. §261.32. Once excavated, substantive RCRA standards for treatment, storage and disposal of these wastes under 40 C.F.R. §264 apply. In addition, disposal of K001 waste is regulated under 40 C.F.R. §268, Land Disposal Restrictions, since placement has occurred. The volume of contaminated soils requiring treatment total approximately 16,100 cubic yards of material. Volume estimates will be further refined during remedial design, and should be considered estimates here.

The typical on-site fixation operation includes a batch plant for mixing the fixative agent (cement, silicate materials, and additives), and conventional construction equipment for excavating and backfilling the soil. The batch plant and staging area for temporary storage of contaminated soils is proposed for a 1.5 acre area in the northwest corner of the SPT site. The staging area will comply with RCRA regulations under 40 C.F.R. §264, Subpart L - Waste Piles, calling for temporary double synthetic liners and a double leachate collection system. The temporary waste and storage facilities will also need to comply with the construction standards for Class I waste piles in Title 23, Subchapter 15, California Code of Regulations (CCR). Cap construction will be as outlined for Alternative 2, and will meet the same RCRA applicable or relevant and appropriate requirements (ARARS).

The fixed soil will meet the leachablity requirements for the appropriate site-specific constituents under RCRA. The maximum concentration of arsenic and chromium characteristic wastes, using EP toxicity, is 5 mg/l under 40 C.F.R. §261.24. It is predicted that fixation will meet land disposal restriction level under 40 C.F.R. §268, of 37 ppm for PCP, using a total waste analysis test.

Also, as discussed previously, soils will be tested during remedial design to determine the soluble fraction of the contaminants and the attenuation factor. Based on this testing, treatment goals needed to protect groundwater will be evaluated by EPA and the RWQCB. The RWQCB recommends site-specific cleanup goals under the authority of the Porter Cologne Water Quality Control Act California Water Code §§13000 et seq.

Under Alternative 3, residual levels of arsenic, dioxin/furan, chromium, copper, and phenols below the health risk-based cleanup goals would remain onsite, untreated. Based on the Endangerment Assessment for SPT it was determined that these residuals will not pose an unacceptable risk to public health or the environment. The solubility testing will ensure that residual levels do not pose a risk to groundwater.

There is a potential for the future breakdown of the monolithic soil matrix. To reduce this potential the fixed soils will be covered with a Cap that meets the RCRA requirements as described under Alternative 2. Long-term monitoring will also be performed to meet the substantive RCRA requirements for closure under 40 C.F.R. §264, Subpart F, G and N.

For the groundwater component of Alternative 3, a conventional precipitation, coagulation, and flocculation process is proposed to remove chromium to the MCL level. Based on the assumption of a 50 ug/l MCL and a two dimensional model, the volume of extracted groundwater requiring treatment is estimated at 2.7 billion gallons. This estimate will be further defined during the remedial design phase of the project, based on additional aquifer testing and monitoring well installation.

Based on the estimate discussed above and the distribution of the plume, approximately 25, 6-inch diameter extraction wells, 50 feet deep will be pumped at a cumulative total of 1,040 gallons per minute for five years. This assumes a treatment plant operating 24 hours a day, seven days a week, with an online availablity of approximately 95%. The five year timeframe is based on several assumptions regarding estimates of extent of contamination, the number of extraction and injection wells, and the volume of groundwater requiring treatment. Specific timeframes will be further defined as part of RD. A range of 5-10 years may be more realistic, depending on the results of data collected during RD.

The treatment facility will consist of an influent storage tank, a rapid mix unit, a slow mix unit, a sedimentation tank, a filter, a treated effluent storage area, and associated piping, valves, and pumps. This facility proposed for location in the vineyard south of the wood treating facility, will occupy approximately 1/2 acre.

Based on satisfactory treatment and testing of the groundwater, either reinjection or off-site disposal will occur. If reinjection is appropriate, approximately 35, 4-inch diameter recharge wells will also be distributed throughout the aquifer.

The treatment level to be achieved is the more stringent of the federal or state Safe Drinking Water Act Maximum Contaminant Levels. Currently this level is 50 ppb, under both federal and state law. Residual untreated groundwater would not exceed the MCL. Residual treated groundwater would either be reinjected or disposed of off-site. For reinjection, substantive requirements of the Safe Drinking Water Act 42 U.S.C. §§1421-1422, 40 C.F.R. §§144-147, would be met. For off-site disposal, the RWQCB would establish discharge limits consistent with requirements under the National Pollutant Discharge Elimination System (NPDES) program. The reinjection of treated groundwater will also be regulated by substantive RWQCB waste discharge requirements to provide protection of the beneficial uses of the underlying groundwater.

The sludge generated from the treatment facility will be dried in lagoons on two acres adjacent to the treatment facility. The sludge will be disposed of at an approved off-site RCRA facility or municipal landfill, depending on sampling results. The sludge lagoons will be constructed to RCRA standards as set forth in 40 C.F.R. §264 - Subpart K - Surface Impoundments, which require two or more liners and a leachate collection system. Synthetic liners are proposed for use at SPT. The sludge lagoons will also need to meet the construction criteria in Title 23, Subchapter 15 of the CCR, regulated by the RWQCB. Other options, for sludge drying, such as mechanical methods, will be considered during the design phase.

Regarding implementation requirements for soil remediation activities under Alternative 3, equipment and materials for Cap construction are readily available. Treatability testing is required for soil fixation, and is currently being performed. There are numerous commercial enterprises involved in developing and marketing fixation technology. Sixteen companies were identified in a vendor survey as capable of providing expertise in treating metals and organics with solidification and stabilization processes. Access to private property will be needed for the batch plant and staging areas.

Short-term worker protection during soil excavation will be required, consistent with federal and California Occupational Safety and Health Act (OSHA and Cal OSHA) standards. EPA currently has federal-lead jurisdication for worker protection at wood treating facilities. However, EPA has adopted OSHA standards for use at these sites. Excavation, storage, and fixation of soil are also subject to Fresno Air Pollution Control District (APCD) Rules 210.1, 404, 405, and 418. Discharges during remediation could include: (1) fugitive dust containing toxic metals and toxic organics, and (2) volatile toxic organics. Requirements of the Clean Air Act, 42 U.S.C. §7401 et seq, are incorporated into APCD Rules, per Section 110 of the Clean Air Act.

For the groundwater component, implementation requirements include disposal of treatment residuals, utility requirements, access to private property for the treatment plant and sludge lagoons, treatability studies for waste stream characteristics, and disposal of treated water. Significant implementation obstacles are not foreseen.

The main uncertainty regarding Alternative 3 is the implementability of soil fixation based on treatability testing. If this test is not successful, it will be necessary to select a different alternative to remediate SPT site soils.

The groundwater classification is Class II A, and implementation of Alternative 3 would be consistent with maintaining the use of the aquifer for drinking water and other purposes.

Short-term institutional controls include limiting access to the staging area, treatment areas, and sludge drying beds, through use of fencing, signs and security. Until remediation of groundwater is achieved, institutional controls over the use of the contaminated portions of the aquifer will be required. Long-term institutional controls include access restrictions to capped and fixed areas, and long-term access for monitoring and maintenance activities.

The implementation timeframe for Alternative 3 is approximately 12-18 months for the soil component and 5-10 years for groundwater treatment.

Costs associated with Alternative 3 are estimated as follows:

Capital:	$ 6,500,000
O&M:	$ 1,300,000
Present Worth:	$11,280,000

D. Alternative 4 - On-site Rotary Kiln with Off-site Disposal and Conventional Groundwater Treatment

This alternative has both treatment and containment (disposal) components. The groundwater components are the same as described in Alternative 3 and will not be discussed further here. The soil treatment component applies to the organic constituents in the soil. An on-site rotary kiln would be used to incinerate dioxin/furan and pentachlorophenol wastes totalling 7800 cubic yards. Included with the organic wastes are metal constituents that would not be destroyed during incineration. In addition, there is another 8300 cubic yards of metals contaminated soil with no organic contamination. All of the soils, treated and untreated (a total of 16,100 cubic yards), would be disposed of at an off-site RCRA facility. The SPT wastes containing pentachlorophenol would require treatment (e.g., incineration) prior to disposal to meet the present RCRA Best Demonstrated Available Technology (BDAT) requirements of 37 ppm, under 40 C.F.R. §268. The untreated arsenic and chromium contaminated wastes are RCRA characteristic wastes and therefore require disposal at an approved RCRA Class I facility.

The mobile unit assumed for SPT is rated at 15 million BTU/hour and treats 4.50 tons/hour of dry solids. The primary (i.e., rotary kiln) and secondary (i.e., afterburner) combustion chambers are generally mounted on concrete slabs. Approximately .5 acres is expected to be required for stockpiling excavated soil, locating feed handling and preparation equipment, and temporary storage of decontaminated soil. Sufficient area for processing exists on the storage yard being used by the present wood treating operation.

For organics, treatment levels achieved would be the BDAT treatment level requirements for PCP of 37 ppm and the 1 ppb clean-up goal for dioxin/furan contamination. For the incinerator, 99.99% destruction and removal efficiency (DRE) is required under 40 C.F.R. §264, Subpart O, for the principal organic hazardous constituents (POHCs). The metals would remain untreated, and would either be captured in the air pollution control equipment or remain in the incinerated soil residuals.

If BDAT for metals under 40 C.F.R. §268 is in effect at the time of project implementation, then these levels would need to be met as well. For this ROD it is assumed that the incinerator soil residuals would require disposal at a RCRA Class I facility due to the metals content of the residue.

Under the California Air Resources Act, California Health and Safety Code §39650 et seq, the Air Pollution Control District (APCD) will set emission limits for discharges associated with use of the incinerator under APCD Rule 210.1, New Source Review. Rules 404, 405, 418 and 417 also apply to excavation and incinerator activities. Discharges associated with soil excavation may consist of: (1) fugitive dust containing toxic metals and/or toxic organics, and (2) volatile toxic organics. Compliance with APCD Rules includes Clean Air Act requirements.

Implementation requirements include access to a mobile rotary kiln, of which there may be a limited supply. Acceptance of SPT wastes at an off-site RCRA facility would be determined based on waste characteristics and BDAT requirements in effect at the time of waste disposal. Access to private property is required for the incinerator, groundwater treatment systems, and monitoring well installation activities. Pilot work would be necessary to aid in addressing materials handling requirements and to assess air emissions.

Alternative 4 would be consistent with the area's Class II A aquifer classification. The contaminated groundwater would be treated and contaminated soils would be removed. The removal of the contaminated soil would prevent the possibility of continuing migration of the contaminants to the groundwater. As stated previously, soil clean-up goals will be evaluated after solubility testing to ensure protection of groundwater quality.

Institutional controls include short-term access restrictions to the soil and groundwater treatment areas, and restrictions over the use of the contaminated portions of the aquifer for drinking water purposes. Long-term institutional controls are not needed for this alternative.

The soils remediation implementation timeframe for Alternative 4 would be 7-10 months at an incinerator unit operating 24 hours a day, seven days a week, with online availability of 80%. An additional 1-2 months would be required to demobilize equipment. Groundwater treatment is estimated to take 5-10 years.

Costs estimated for Alternative 4 include:

Capital:	$15,630,000
O&M:	$1,290,000
Present worth:	$20,360,000

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Overall Protection of Human Health and the Environment

1. No Action: No protection is provided, although monitoring would provide a warning indicator of contaminant transport.

2. RCRA Cap with Slurry Wall: Partial protection is provided, with ongoing maintenance. The migration of contaminated groundwater is restricted from reaching uncontaminated portions of the aquifer. Direct contact with soils and generation of contaminated airborne dust is prevented. The Cap also limits infiltration of surface water and contaminant mobility. Institutional controls are necessary to prevent the use of contaminated groundwater exceeding primary drinking water standards. Continued leaching of capped soils due to groundwater fluctuations could exacerbate the chromium contamination problem.

3. Soil Fixation with RCRA Cap and Conventional Groundwater Treatment: For soil, protection is provided with ongoing maintenance. Cap protection features are the same as for Alternative 2. Addition of the fixative agent greatly reduces continued leaching of contaminants to groundwater, protecting potable water supplies from a continuing source of contamination. Groundwater treatment provides complete protection to the MCL cleanup level.

4. On-site Rotary Kiln and Off-site Disposal with Conventional Groundwater Treatment: For soil, complete protection is provided on-site. No contaminants exceeding the cleanup goals remain at SPT. Careful short-term incinerator operation would be

required to assure that significant adverse air quality impacts do not occur. For groundwater, the same complete level of protection is provided as for Alternative 3.

B. Compliance with ARARS

1. Alternative 1: Does not comply with MCLs for groundwater. No action would be taken to meet ARARS.

2. Alternative 2: Does not comply with MCL for chromium or Porter Cologne Water Quality Act cleanup goals for soils (a requirement "to be considered," rather than an ARAR). Would comply with RCRA requirements under 40 C.F.R. §264, Subparts F, G, and N.

3. Alternative 3: Will comply with all ARARS, including MCLs, RCRA BDAT for K001 listed waste, and RCRA closure requirements.

4. Alternative 4: Would comply with all ARARS identified at this stage, including MCLs, RCRA BDAT for K001 listed waste, and RCRA requirements for off-site disposal of waste.

C. Long-term Effectiveness and Permanence

1. Alternative 1: Not a permanent solution.

2. Alternative 2: Not a permanent solution. Long-term monitoring and maintenance activities are associated with the Cap. Groundwater is not treated. Long-term institutional controls would be required to ensure that drinking water wells are not located in the contaminated portions of the aquifer.

3. Alternative 3: For soil, full permanence cannot be assured due to limited experience with the fixation technology. Long-term maintenance and monitoring is required. Depending on the monitoring results, additional work could be required in the future if the monolithic soil matrix breaks down. For groundwater, a permanent solution.

4. Alternative 4: For soil, a permanent solution for organics (dioxin/furans and PCP); but not permanent for metals. Off-site disposal requires long-term O&M at the RCRA facility. For groundwater, a permanent solution.

D. Reduction in Toxicity, Mobility and Volume (TMV)

1. Alternative 1: Does not reduce TMV.

2. Alternative 2: Reduces mobility but not toxicity or volume.

3. Alternative 3: For soil, mobility significantly reduced, toxicity is not reduced, and volume is increased due to the addition of the fixative agent. For groundwater, TMV reduced.

4. Alternative 4: For soil, near complete reduction of toxicity and mobility for organics. For metals, reduces mobility only by removing contaminants from the site and containing them in a Class I RCRA facility. For groundwater, TMV reduced.

E. Short-term Effectiveness

1. Alternative 1: There would be no short-term impacts.

2. Alternative 2: Short-term impacts to workers associated with slurry wall and Cap construction would be minimal.

3. Alternative 3: Short-term exposure to workers during soil excavation and treatment, and groundwater well installation could occur. Worker safety precautions and dust suppression needed to protect workers and others onsite and in site vicinity.

4. Alternative 4: Short-term impacts would be comparable to Alternative 3. Differences include short-term potential for accidental spillage during off-site transport of wastes and exposure to incinerator emissions. Air pollution control equipment and careful transport required in addition to measures outlined in item 3, above.

F. Implementability

1. Alternative 1: No implementability factors are relevant.

2. Alternative 2: The technology for both the RCRA Cap and slurry wall are readily available. The technical feasibility of the slurry wall is questionable due to potential problems with inadequate thickness and continuity of the clay layer. Access problems associated with the slurry wall alignment may also arise.

3. Alternative 3: The RCRA Cap and conventional groundwater treatment technologies are readily available and proven. Property access/acquisition problems may arise for the well installation and treatment areas. Fixation technology requires site-specific treatability testing to verify effectiveness prior to use.

4. Alternative 4: Conventional groundwater treatment issues are the same as under Alternative 3, above. Use of incinerator requires prior on-site treatability testing in coordination with the local APCD. Off-site disposal of wastes requires acceptance by the receiving facility depending on actual waste characteristics analysis. Regulatory status governing off-site disposal of land ban wastes may influence disposal options at time of remedial action.

G. Estimated Capital, O&M, and Present Worth Cost

	CAPITAL	O&M	PRESENT WORTH
Alt 1 No Action	$18,000	22,000	90,000
Alt 2 Slurry Wall/ RCRA Cap	2,180,000	40,000	2,390,000
Alt 3 GW Treatment/ Fixation	6,500,000	1,300,000	11,280,000
Alt 4 GW Treatment/ Rotary-Kiln/ Off-Site Disposal	15,630,000	1,290,000	20,360,000

H. State and Community Acceptance

1. Alternative 1: Not acceptable to the state; no input was received from the community.

2. Alternative 2: Not acceptable to the state due to potential insufficiency of clay layer to key slurry wall into and because chromium remaining in soils under the Cap could leach to groundwater. No community input received.

3. Alternative 3: Acceptable to the state. Additional remedial design-related groundwater and soil sampling and treatability testing will be reviewed by the state for continued acceptance of remedy. No community comments received.

4. Alternative 4: State concerned about potential incinerator emissions-related public perception and regulatory approval problems. Incinerator pilot testing and remedial design-related sampling results would be reviewed by the state. No community issues raised at this time.

IX. THE SELECTED REMEDY

Alternative 3 - Conventional Water Treatment and Soil Fixation with a RCRA Cap, has been selected as the remedy for the SPT site. Remediation of the chromium contaminated groundwater under this alternative consists of pumping the groundwater from the aquifer, treating it in an on-site facility utilizing a conventional water treatment method, and disposing of the treated effluent through reinjection into the aquifer, or off-site, as appropriate.

The soil remediation component of this alternative consists of excavating the contaminated soil, transporting it to a processing plant onsite; "fixing" the soil with cement, silicate and other bonding agents; and then backfilling and compacting the fixed material on-site. Fixed areas of soil will then be covered with a RCRA Cap.

X. THE STATUTORY DETERMINATIONS

A. Protection of Human Health and the Environment

The selected remedy will eliminate risk of exposure to groundwater contaminated with chromium above MCL levels. The remedy will eliminate exposure to contaminated soil that exceeds groundwater and health based cleanup goals. In the case of soils, the contaminants will not be removed or destroyed. Long term O&M is required to ensure that the soil remedy is effective.

Adequate safety precautions will be used during construction and treatment activities. Therefore, unacceptable short-term impacts are not expected. Cross media impacts are also not foreseen associated with this remedy. Careful attention to drilling techniques will be paid to ensure that drilling will not contaminate the deeper, unaffected portions of the aquifer. Cleanup goals will take into account the potential leaching of soil contaminants into the groundwater. Careful dust suppression methods during all remedial activities will ensure that contaminants are not transmitted into the air at unacceptable levels during construction. The RCRA Cap will provide long-term protection agaist transmission of contaminated particulates into the air.

B. Attainment of ARARS

The selected remedy will attain the applicable or relevant and appropriate requirements determined to date; no ARARS waiver is necessary. The following are the main ARARS that have been determined to apply to the remedy:

Statute	Standard
Safe Drinking Water Act 42 U.S.C. §300A *et seq*; 40 C.F.R Part 141.	Maximum contaminant levels for chromium and arsenic in groundwater.
Safe Drinking Water Act 42 U.S.C. §300A *et seq*; 40 C.F.R. Parts 144-147.	Underground injection control requirements for Class V Wells, including dry wells.

Safe Drinking Water Act 42 U.S.C. §1424(e).	Prohibits any project with federal financial assistance from contaminating a Sole Source Aquifer.
Resource Conservation and Recovery Act 42 U.S.C. §6901 et seq; 40 C.F.R. Parts 257, 261, 262, 263, 264, 265, 268.	Practices to be followed by generators, transporters, owners and operators of hazardous waste. Standards for land disposal of certain restricted hazardous wastes.
California Safe Drinking Water and Toxic Enforcement Act. California Health and Safety Code §252.5 et seq.	The state MCL for chromium.
California Air Resources Act. California Health and Safety Code §39650 et seq.	Discharge limits for activities conducted during the remedial action. Includes Clean Air Act requirements.
Porter Cologne Water Quality Control Act. California Water Code §13000 et seq.	Waste discharge requirements, NPDES discharges, specific cleanup standards established on a site specific basis.
California "Superfund" Law - Hazardous Substances Account Act/ Hazardous Substances Cleanup Bond Act. California Health and Safety Code §25300 et seq.	Substantive requirements of a Remedial Action Plan (RAP).
California Occupational Safety and Health Act. California Laboratory Code §6300 et seq.	Standards for worker protection during remediation.
Occupational Safety and Health Act. 29 U.S.C. §651 et seq.	Under 40 C.F.R. §300.38, OHSA requirements apply to all activities conducted under the NCP.

C. Cost-Effectiveness

The selected remedy estimated at $11,280,000 is the least expensive of the remedies that meet the statutory criteria of protection of public health and the environment, and attainment of ARARS. For example, alternative 4, Conventional Water Treatment/Incineration and Off-site Disposal is estimated at $20,360,000; almost double the selected remedy. Alternative 2, slurry wall/RCRA Cap, is much less costly than the selected remedy at an estimated $2,390,000; but would not be protective of public health or meet ARARs.

D. Utilization of Permanent Solutions Employing Alternative Technologies to the Maximum Extent Practicable (MEP)

The selected remedy is an appropriate solution for the site. It will effectively treat groundwater contaminants, prevent contact with soil contaminants, and prevent leaching of contaminants to the groundwater at levels above the MCL. The remedy provides protection of public health, achieves ARARS compliance and is cost-effective.

In comparison, on-site and off-site RCRA disposal options are more problematic for soils at SPT than the chosen method of fixation. An on-site RCRA landfill would not meet RCRA or CCR siting criteria due to the site geology and presence of a Sole Source Aquifer. Since BDAT was not established for the dioxin K001 waste, it could conceivably be disposed of off-site, along with the metal contamination, without treatment. The PCP wastes would require treatment to the 37 ppm BDAT standard. However, straight off-site disposal of wastes does not comply with the intent of CERCLA for remedies that use permanent solutions and treatment to the maximum extent practicable. Finally, the regulatory status governing land disposal of SPT waste is in a state of development. It is not certain whether RCRA disposal facilities would accept SPT wastes at the time of remediation; and if so, what Best Demonstrated Available Technology (BDAT) would be required (BDAT may be promulgated for arsenic).

In regard to soil treatment methods, fixation and incineration were the only two that were deemed technically feasible in the FS screening process. Incineration, however, treats only the organic contents of the SPT waste, resulting in untreated metals requiring disposal. Fixation has been identified as a feasible technology for the low organic/high metals ratio in the SPT wastes. (Treatability testing will be performed to ensure that this method will effectively treat SPT wastes). The sandy-silty soil composition at SPT is also amenable to fixation.

Several nonthermal treatment process for removing soil contaminants at SPT were examined, including physical, chemical, and biological. Of the physical methods, (fixation and soil washing), soil washing was found not to be effective for removing the relatively low arsenic and chromium concentrations in the waste, and is not an effective remedy for organic wastes. For chemical methods, nucleophilic substitution, or KPEG, only applies to the organics and has not been demonstrated effective in removing the dioxin/furan concentrations to the 1 ppb level.

Biological treatment processes, both on-site and in-situ, were examined for soil treatment. Biological treatment applies only to the organic contaminants in the waste, and does not treat the metals. However, laboratory tests did not show reduction of dioxins to the 1 ppb level and no large scale pilot studies have been conducted on use of biodegradation for dioxin wastes.

For groundwater treatment, the metals-precipitation chromium removal technology selected for groundwater cleanup is a conventional and effective method commonly used in industrial processes. The other groundwater treatment method evaluated in detail was ion exchange. However, ion exchange processes would not be effective in treating site groundwater due to the potential for clogging of the resins. Clogging occurs as the trivalent chromium in the water will readily precipitate out of solution as chromium hydroxide. In addition, large quantities of brine are generated, increasing costs over conventional treatment without greater protection.

Therefore, in comparison to other possible technologies, soil fixation with a RCRA Cap and conventional groundwater treatment have been determined to be the most appropriate technologies for the SPT site.

For groundwater, the remedy selected is considered the maximum extent to which a permanent solution and treatment can be practicably utilized. For soil, full permanence cannot be assured due to limited experience with the fixation technology. Therefore, long-term monitoring is required. In terms of treatment, the contaminants are rendered immobile by application of the fixative agent. However, this form of treatment does not reduce contaminant volume or significantly reduce toxicity.

A fully permanent treatment solution for the combination of wastes present in the SPT soil was not determined to be feasible at this time. Therefore, the selected remedy represents the maximum extent to which permanent solutions and treatment can be practicably utilized.

2

ATTACHMENT 2

SELMA PRESSURE TREATING COMPANY SUPERFUND SITE

Final
EXPLANATION OF SIGNIFICANT DIFFERENCES
From the 1988 Record of Decision

I. Introduction

On September 24, 1988, the United States Environmental Protection Agency (EPA) signed a Record of Decision (ROD) for the final remedial actions at the Selma Pressure Treating Company Superfund site, located in Selma, California. The EPA is the lead agency for the investigation and clean up of the site; the primary state agency is the California Environmental Protection Agency, Department of Toxic Substances Control.

Since 1988, the EPA has been conducting treatability studies, collecting additional field data, and preparing design plans and specifications for construction of the remedy. In the course of conducting these additional studies and preparing detailed designs, the EPA in consultation with other regulatory agencies has modified certain aspects of the remedial actions and clean up levels. The purpose of this document is to explain the significant differences that have come about since the ROD was written in 1988. These differences, though significant, are not a fundamental alteration of the remedy described in the ROD.

Under Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §9617, and pursuant to 40 C.F.R. Section 300.435(c)(2)(i) (55 Fed.Reg. 8666, 8852 (March 8, 1990)), EPA is required to publish an Explanation of Significant Differences (ESD) whenever a significant (but not fundamental) change is made to a final remedial action plan as described in a ROD.

This document provides a brief background of the Selma site, a summary of the remedy selected in the ROD, a description of the changes to the ROD that EPA is now making (including how the changes affect the remedy originally selected by the EPA in the 1988 ROD), and an explanation of why the EPA is making these changes to the ROD.

The EPA is issuing this ESD to clarify certain aspects of the clean up standards for the site, to explain changes in certain remedial action details described in the ROD, and to document compliance with Land Disposal Restrictions under the Resource Conservation and Recovery Act through a Treatability Variance.

This ESD:

(A) changes the term "clean up goal" to "clean up standard" wherever it is used in the ROD;

(B) revises the clean up standard for arsenic in surface soils from 50 mg/kg to 25 mg/kg, a more stringent standard;

(C) sets a clean up standard for pentachlorophenol in ground water at 1 ppb to comply with a new, more stringent drinking water Maximum Contaminant Level (MCL) and sets a clean up standard for pentachlorophenol in soil at 17 ppm;

(D) identifies additional areas of soil contamination that require excavation and treatment, and revises the total volume and on site disposal location;

(E) modifies the implementation of the ground water extraction and reinjection system to reflect a more phased, observational approach for the siting and design of the wells, with an initial phase consisting of 4 extraction and 6 reinjection wells; and

(F) documents compliance with RCRA Land Disposal Restrictions through a Treatability Variance for the contaminated soil.

As required by 40 C.F.R. Section 300.825(a)(2), the ESD will become part of the Administrative Record file for the Selma site. This file is available for public review during normal business hours in the EPA Region 9 Superfund Record Center, 75 Hawthorne Street, San Francisco, California, 94105.

II. Summary of Site History, Contamination Problems, and Selected Remedy

Site History

The Selma site is located in Fresno County, California, about 15 miles south of Fresno and adjacent to the southern city limits of Selma. The site comprises approximately 18 acres, including a 4 acre wood treatment facility and 14 acres of adjacent vineyards that were used for site drainage. Zoned for heavy industrial use, the site is located in a transition zone between agricultural, residential, and industrial areas. There are 12 residences and businesses within 1/4 mile of the site.

The company that originally operated at the site, Selma Pressure Treating Company, ceased operation and filed for bankruptcy in 1981. There is another wood treating company, Selma Treating Company, currently leasing the land and operating on the site.

The wood preserving process originally employed at the site involved dipping wood into a mixture of pentachlorophenol and oil, and then drying the wood in open racks to let the excess liquid drip off. A new facility was constructed in 1965, and the company converted to a pressure treating process which consisted of conditioning the wood and impregnating it with chemical preservatives. Known chemical preservatives used at the site include Fluor-chromium-arsenate-phenol, chromated copper arsenate, pentachlorophenol, copper-8-quinolinolate, LST concentrate, and Woodtox 140 RTU.

Prior to 1982, discharge practices included: (1) runoff into drainage and percolation ditches, (2) drainage into dry wells, (3) spillage onto open ground, (4) placement into an unlined pond and a sludge pit, and (5) discharges to the adjacent vineyards.

Contamination Problems

Efforts by regulatory agencies to get the company to comply with clean up orders were unsuccessful and the company went bankrupt in 1981. EPA placed the site on the National Priorities List of hazardous waste sites in 1983.

A Remedial Investigation/Feasibility Study was conducted by the EPA to characterize the areas of contamination and develop clean up alternatives for the site. The investigations revealed several areas of soil contamination and a plume of contaminated ground water eminating from the site. Elevated levels of the heavy metals arsenic, chromium and copper were found in both surface and subsurface soils. Soil analyses also showed elevated levels of the organic compounds pentachlorophenol (PCP) and dioxin/furan. While there were several contaminants at elevated levels in the soil, chromium was the only contaminant found to be significantly elevated in the ground water.

Additional soil and groundwater studies were conducted after the ROD was signed to provide more detailed characterization for the design of the remedial actions. The supplemental investigation of the soils provided a more accurate delineation of the areas of contamination and identified additional areas needing remediation. The supplemental ground water investigations provided a more accurate picture of the extent of contamination and the pumping characteristics of the aquifer, and revealed that the ground water table had dropped to below the elevations where the highest levels of chromium had been found during the original investigation. Sampling and analysis of the ground water utilizing more sensitive protocols also revealed that PCP may be present in levels exceeding a new, more stringent drinking water MCL of 1 ppb, promulgated after the ROD was prepared (the previously proposed MCL for PCP had been 37 ppb).

Remedy Selected in the 1988 ROD

The remedy selected in the original Record of Decision is composed of two components, one for contaminated soils and one for contaminated ground water. The soil remediation component consists of excavating the contaminated soil, treating it on site with a fixative agent, and then backfilling and compacting the fixed material on site. fixed areas of soil were then to be covered with a RCRA cap. For remediation of the contaminated ground water, the ROD calls for extraction and treatment of it in an on site facility utilizing a conventional precipitation, coagulation, and flocculation process, with either reinjection or off site disposal of the treated effluent, and disposal of sludge at an approved off site landfill. Institutional controls were also required to prevent future activities or developments on the site that could impact the integrity and maintenance of capped materials or create opportunities for increased exposures such as those that would occur in a residential area.

The ROD defined clean up goals for the soil and ground water components in terms of organic and heavy metal contaminants that, according to the risk assessment, would act as indicator contaminants and drive the clean up. For soils the two driving organic and heavy metal contaminants were found to be dioxin/furan, with a clean up goal of 1 ppb by TCDD equivalents, and arsenic with a clean up goal of 50 ppm. For ground water the ROD set a single clean up goal of 50 ppb for total chromium, which was the MCL at the time.

Criteria were also established for treatment of the excavated soil prior to redisposal. Treated soil was required to meet RCRA requirements. The maximum concentration of arsenic and chromium in treated soil, using EP toxicity testing, was 5 mg/l under 40 C.F.R. Part 261.24, and 37 ppm for PCP using a total waste analysis under 40 C.F.R. Part 268.

III. Description of the Significant Differences and the Basis for Those Differences

This ESD clarifies and modifies several portions of EPA's 1988 ROD for the Selma site. To the extent that this ESD differs from the ROD, the ESD supersedes the ROD.

The fundamental nature of the remedial actions for the Selma site have not changed; contaminated soils are still to be excavated, treated with a fixative agent, disposed of on site, and capped in accordance with RCRA standards. Ground water is still to be extracted, treated using conventional precipitation to remove chromium contamination, and reinjected into the aquifer.

Certain aspects of the remedy have been modified as a result of 1) additional data gathered subsequent to the ROD; 2) changes in Federal and State promulgated standards for contaminants found at the site; 3) reconsideration during the design phase of certain aspects of technical and material handling; and 4) clarification of the applicability of RCRA Land Disposal Restrictions for soil and debris. The significant changes from the ROD, and the rationale for those changes, are as follows.

A. Clean up Standards

This ESD uses the term "clean up standard" rather than "clean up goal". This ESD changes the term "clean up goal" to "clean up standard" wherever it occurs in the 1988 ROD.

B. Clean up Standard for Arsenic in Surface Soils

The clean up standard for arsenic in surface soils identified in the ROD, 50 ppm, was selected to be protective of all direct contact exposure scenarios except on site residential development. The ROD further required implementation of institutional controls to prevent future on site residential development.

Upon subsequent consultation with the California Environmental Protection Agency and review of other RODs from throughout the U.S. that have subsequently set arsenic clean up standards for direct contact exposure scenarios, EPA has determined that a lower clean up standard for arsenic is appropriate, and would not rely on institutional controls to assure adequate health protection. Therefore, a new clean up standard of 25 ppm has been established for arsenic in surface soils at the Selma site. All surface soils (down to a depth of five feet) containing arsenic in excess of 25 ppm shall be excavated, treated, and disposed of beneath a RCRA cap.

C. Clean up Standard for Pentachlorophenol in Ground Water

The 1988 ROD did not identify a specific clean up standard for PCP in ground water, since it had not been detected in ground water at levels any where near the MCL proposed at the time the ROD was signed, 200 ppb. Subsequent revisions to the drinking water MCLs have resulted in the PCP level being lowered to 1 ppb. PCP has been detected in ground water on or near the site in levels elevated above 1 ppb. Therefore, this ESD establishes a clean up standard of 1 ppb for PCP in ground water at the Selma site, and requires that the treated effluent from the ground water treatment plant meet the same standard before it is reinjected or otherwise discharged.

The new, stricter MCL for PCP came about due to new evidence on the potential carcinogenicity of the compound. Based on this information, EPA and California DTSC re-evaluated the need for a soil clean up standard for PCP; based on our risk analyses, a new soil clean up standard of 17 ppm has been selected to assure that direct human exposures to soil at the site do not exceed the acceptable risk range prescribed in the NCP, and to assure that residual levels remaining at the site do not have the potential to cause ground water contamination.

It should be noted that the federal MCL for chromium was changed in July 1992, from 50 ppb to 100 ppb. Since the California

State MCL has not been relaxed, we have retained the same clean up standard for chromium in ground water that was selected in the ROD, 50 ppb. Should the State MCL be revised to match the federal MCL, the clean up standard for chromium in ground water at the Selma site will also be adjusted to 100 ppb.

D. Additional Areas of Soil Contamination to be Excavated

The 1988 ROD identified four areas where contaminated soil exceeded clean up standards and required clean up. At the time of the ROD, the total volume of soils requiring remediation was estimated at 16,100 cubic yards, and the treated soils were to be backfilled into the areas from which they were excavated.

Subsequent soil investigations provided more precise volume estimates and identified additional areas where contaminated soil exceeds clean up standards and requires excavation and treatment. The revised list of areas requiring excavation are identified in Table A. The new estimate for the total volume of contaminated soil to be excavated is now 11,500 cy. Also, rather than returning treated soils to the areas where they were excavated, all treated soils will now be consolidated into a single unit on the site, under a single RCRA cap.

E. Changes in the Design of the Ground Water Extraction, Treatment, and Disposal System

The ROD described the ground water remediation both in concept (i.e. extraction of ground water exceeding MCLs, treatment, and disposal either by reinjection or off site discharge), and in detail (construction of 25 extraction wells, 50 feet deep, pumped at a cumulative total of 1,040 gallons per minute). Although the concept remains the same (with the addition of the 1 ppb clean up standard for PCP identified in paragraph C above), the design of the extraction and treatment system has been modified. Rather than installing 25 wells, the ground water extraction system will be developed in phases, with the first phase consisting of 4 wells, screened at a depth of 70 feet. The treatment plant will be constructed to an effective design capacity of 250 gpm, and will be expandable. Treated effluent will be discharged back into the aquifer through 8 injection wells. Based on information gathered from the operation of this initial phase of ground water extraction, treatment, and reinjection, additional wells will be installed and/or additional treatment plant capacity will be constructed, as appropriate.

F. Documentation of Compliance with Land Disposal Restrictions through a Treatability Variance for Contaminated Soil

As described in the original Record of Decision, RCRA Land Disposal Restrictions (40 C.F.R. Part 268) are applicable to the

TABLE A

CONTAMINATED
SOILS EXCAVATION***

Area	Location		Length (feet)	Width (feet)	Depth (feet)	Soils Volume (cubic yards)
A	West half of South Percolation		335 ft	14 ft	10 ft	1740 cy
B	East half of South Percolation		135 ft	14 ft	10 ft	700 cy
C	Unlined Waste Disposal Pond		122 ft	70 ft	*10 ft	3160 cy
D	West half of North Percolation Ditch		235 ft	14 ft	25 ft	3050 cy
E	East half of North Percolation Ditch		185 ft	14 ft	10 ft	960 cy
F	Wood Treatment Area		N/A	**π(25 ft)^2	5 ft	360 cy
G	Cal Trans Ditch		141 ft	14 ft	1 ft	75 cy
H	Southeast Disposal Area	H1	N/A	**π(25 ft)^2	5 ft	1455 cy
		H2	N/A	**π(25 ft)^2	5 ft	
		H3	N/A	**π(25 ft)^2	10 ft	
TOTAL						***11,500 cy

* Average Depth
** Circular Surface Area
*** Does not include "Possible Contaminated Soils", which, as shown in the Plans, must also be excavated.

remedial actions for contaminated soil at the Selma site. However, the ROD did not appropriately identify the means by which the remedial actions will comply with the LDRs. The ROD inaccurately stated that the contaminated soil is considered to be a K001 listed waste under 40 C.F.R. Part 261.32. K001 is a class of listed wastes under RCRA consisting of sludges and tank bottoms from treatment processes for wood preservative wastes. The soil at the Selma site became contaminated from dripping, spillage, and the direct discharge of spent wood treating solutions onto the property. The levels of contamination exceed the threshold for RCRA characteristic wastes. Therefore, the Selma soil is a characteristic, rather than a listed RCRA waste.

Because the contaminated soil at the Selma site is a characteristic RCRA waste, treatment must comply with Land Disposal Restrictions. Often, Superfund wastes differ significantly from the waste used to set the LDR treatment standard (LDR treatment standards are generally based on treating less complex matrices of industrial process wastes, rather than contaminated soil and debris). Since treatment standards have not yet been promulgated for soil and debris, there is a presumption that Superfund response actions involving the placement of soil and debris will utilize a Treatability Variance to comply with the LDRs.

The selected remedy for contaminated soils at the Selma site will comply with the LDRs through a Treatability Variance under 40 C.F.R. Part 268.44. This Variance will result in the use of a fixation/solidification technology to attain the Agency's interim treatment level range for the contaminated soil at the site. The treatment level range established through a Treatability Variance for each constituent as determined by the indicated analyses are:

Pentachlorophenol	90 - 99% reduction (TWA)
Chromium	95 - 99.9% reduction (TCLP)
Arsenic	90 - 99.9% reduction (TCLP)

Based on treatability studies conducted on the contaminated soil from the Selma site, it is anticipated that full scale operation of the selected technology will comply with these standards.

IV. Support Agency Comments

The California Environmental Protection Agency, Department of Toxic Substances Control was provided an opportunity to comment on this draft ESD before it was sent out for public review. Based on comments received from DTSC, EPA added language in the ESD pertaining to the soil clean up standard of 17 ppm for pentachlorophenol.

V. Affirmation of the Statutory Determinations

Considering the new information that has been developed and the changes that have been made to the selected remedy, the EPA believes that the remedy remains protective of human health and the environment, complies with federal and state requirements that were identified in the ROD and in this ESD as applicable or relevant and appropriate to this remedial action at the time this ESD was signed, and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.

VI. Public Participation

A public notice fact sheet describing this Explanation of Significant Differences was distributed to people on EPA's mailing list of interested community members for the Selma site in May 1992. A public notice was also placed in the Fresno Bee newspaper on May 8, 1992. The fact sheet summarized the changes proposed in the draft ESD, identified the repository in Selma where the entire text of the draft ESD could be reviewed, and provided a period for public comments from May 8 to June 8, 1992. (A public comment period was included for this ESD because EPA invoked a RCRA treatability variance.) EPA received no public comments on the draft ESD. Therefore, the changes identified in this ESD are identical to the changes identified in the version made available to the public in May 1992.

John Wise — 10.26.93

John C. Wise — Date

Deputy Regional Administrator

034 00282

ATTACHMENT 3

TECHNICAL MEMORANDUM ON THE RESULTS

OF

REMEDIAL DESIGN PERCOLATION TESTS

AT THE

SELMA PRESSURE TREATING SUPERFUND SITE

PREPARED FOR

U. S. ENVIRONMENTAL PROTECTION AGENCY
75 HAWTHORNE STREET
SAN FRANCISCO, CA 94105

BY

BECHTEL NATIONAL, INC.
50 BEALE STREET
SAN FRANCISCO, CA 94119

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FIGURES

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1.0 SCOPE OF WORK PERFORMED

Bechtel prepared, issued, and negotiated an invitation for bid for subcontract services at the Selma Pressure Treating site to provide all necessary labor, tools, supplies, equipment, personnel, transportation, supervision, suppliers, and materials to: drill test boreholes; perform borehole permeability tests; construct monitoring wells; construct, test, and backfill a percolation test pit; and construct, perform infiltration test on, and abandon (if required) stone columns, if necessary. Based on results of the initial borehole permeability tests, construction of stone columns (Option 2) was not required and construction of a percolation test pit (Option 1) was conducted.

By investigating local suppliers and conditions, Bechtel arranged the required water supply for the percolation test under an agreement with the California Water Services Company and the Upright Platform Company, adjacent to the Selma site, to supply a metered-hydrant water supply at commercial rates. Bechtel provided expert oversight and procured subcontracted plumbing services for meter hookup, piping, and valves required to deliver a constant, reliable water supply.

The work was performed in the following sequence, under Bechtel supervision, by the subcontractor:

- Drilled boreholes and performed permeability tests;
- Constructed monitoring wells;
- Constructed a percolation test pit;
- Performed percolation testing;
- Backfilled pit; and
- Breakdown of equipment, cleaned and restored work site.

1.1 Subcontractor Responsibility

BSK & Associates, Inc., performed all field work at the Selma site and constructed a temporary working pad adjacent to the test pit location, surrounded by a gated, lockable 6-foot chain link fence to prevent entry by unauthorized persons or animals. The working pad included a decontamination area divided into an exclusion zone, contamination reduction zone and support zone. Responsibilities of the subcontractor during the execution of the test period were the following:

- Obtain any necessary permits for performing the work;
- Check drilling and excavation locations for underground utility interference, per the Existing Site Utilities Plan provided;
- Locate and survey boreholes and the boundaries, top, and bottom of the test pit;
- Deliver to the site required construction equipment, materials, tools and supplies, supervision and labor to:

- Drill and sample two test boreholes,
- Perform borehole permeability tests,
- Install monitoring wells in the two boreholes,
- Construct a percolation test pit,
- Perform percolation testing,
- Backfill percolation test pit, and
- Breakdown and remove equipment and supplies from site; and

• Clean and restore work areas.

All drill cuttings were stockpiled on plastic sheeting in an area adjacent to the test pit. Pit excavation materials were used to construct the berm around the test pit. The drill cuttings and excavated soil were backfilled into the test pit at the end of the testing period. Dust control was provided during drilling and excavation activities by use of water spraying to minimize visible air emissions. After completion of testing, fencing was removed and work areas were cleaned and restored to as near their original condition as feasible. Locks were provided for the two monitoring wells to allow their future use in monitoring recharge pond performance.

1.2 Borehole Permeability Tests

Two boreholes were drilled adjacent to the location of the outer boundary of the test pit to: facilitate the performance of permeability tests at 5 and 10 feet below ground surface (bgs); and facilitate the installation of two monitoring wells. The two test boreholes were drilled with nominal six-inch diameter hollow stem auger to depths of 18 and 55 feet bgs. Eight subsurface soil samples were collected from the boreholes using a Standard Penetration Test sampler, in accordance with ASTM D1586-84. Permeability tests were conducted at depths of 5 and 10 feet bgs in each borehole. The tests were performed by measuring the rate of water needed to maintain a constant head inside the hollow stem augers. Coarse sand was utilized in the bottom of the hole to reduce caving. The borehole permeability tests were conducted for periods of 23 to 60 minutes, until a steady-state flow rate was approximately achieved.

1.3 Monitoring Wells

Subsequent to the drilling and testing of the boreholes described above, two monitoring wells were completed in each of the two tested boreholes. Work associated with these wells was performed in accordance with Technical Specification TS-034-003. The monitoring wells were installed within the vadose and saturated zones to bottom depths of 18 and 55 feet bgs, respectively. Wells were completed inside 6-inch hollow stem augers and constructed with two-inch diameter, Schedule-40, polyvinylchloride (PVC) casing. The bottom 10 feet of the wells were transversely slotted with 0.01-inch width slots and terminated with a threaded cap. The top of the PVC casing was extended approximately three feet above ground.

The annulus was filled with approximately 12.5 feet of filter pack, consisting of Monterey #3 silica sand, from the bottom of the well to approximately two feet above the well screen. Prior to the addition of a bentonite seal, the well was surged to settle the surrounding sand filter pack. A 2.5-foot plug of hydrated bentonite pellets was placed on top of the filter pack, prior to the grout seal. The remaining annulus was filled to ground surface with a neat cement. Protective surface casing of steel was installed to a depth of three feet and threaded with a locking cap.

1.4 Percolation Pit Construction and Testing

A test basin was constructed with bottom dimensions of 25- by 25-foot square, surrounded by slopes cut to a 2.5 horizontal to 1 vertical grade. The bottom depth was 5 feet bgs, as directed by Bechtel. A 2- to 3-foot high protective berm was constructed around the test pit with the excavated soil. Compaction of the test pit bottom was minimized during excavation. Compaction of the slopes was performed as deemed necessary to prevent slumping. The test pit location and as-built drawings are shown in Figures 1 and 2, respectively. A drop basin was constructed at the water inlet to minimize erosion during pond filling and testing. A staff gauge was installed in the basin near the edge for measurement of water depth. In addition, an evaporation pan, rain gage, and thermometer, were also provided for the duration of the testing.

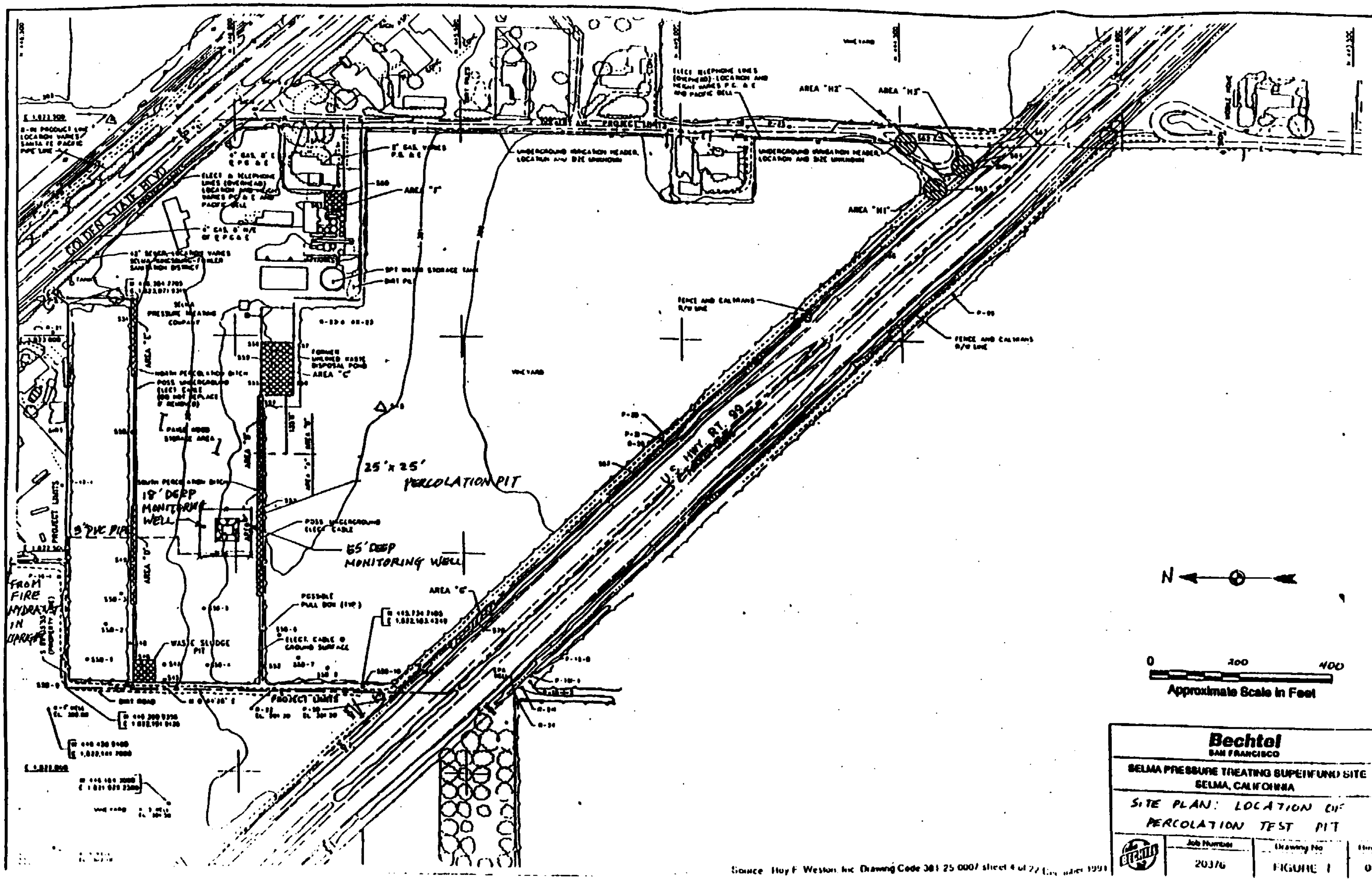
The percolation pit test consisted of the following work:

- Filled the test basin to approximately 2.75 feet height of water, and monitored and controlled the flow of water into the test pit continuously for 48 hours; and

- Subsequently performed periodic work, initially on a daily basis:
  - Measured water level in test pit at the staff gauge,
  - Measured water temperature in test pit,
  - Adjusted the inflow of water to maintain a relatively constant water depth of 2.5 to 3 feet,
  - Measured evaporation rate and refill evaporation pan,
  - Measured rain gauge, if any precipitation occurred, and
  - Measured water levels, if any, in the two test monitoring wells.

2.0 SUMMARY OF TEST RESULTS

Geologic logging of the boreholes, borehole permeability testing, and well installation are described in Attachment 1. The percolation test data recorded by the subcontractor are provided in Attachment 2. The calculation of the recharge rate and estimate of pond size required for the treatment plant are provided in Attachment 3. The



Bechtel
SAN FRANCISCO

SELMA PRESSURE TREATING SUPERFUND SITE
SELMA, CALIFORNIA

SITE PLAN: LOCATION OF
PERCOLATION TEST PIT

Job Number	Drawing No.	Rev.
20376	FIGURE 1	0

Source: Roy F. Weston Inc. Drawing Code 381 25 0007 sheet 4 of 22

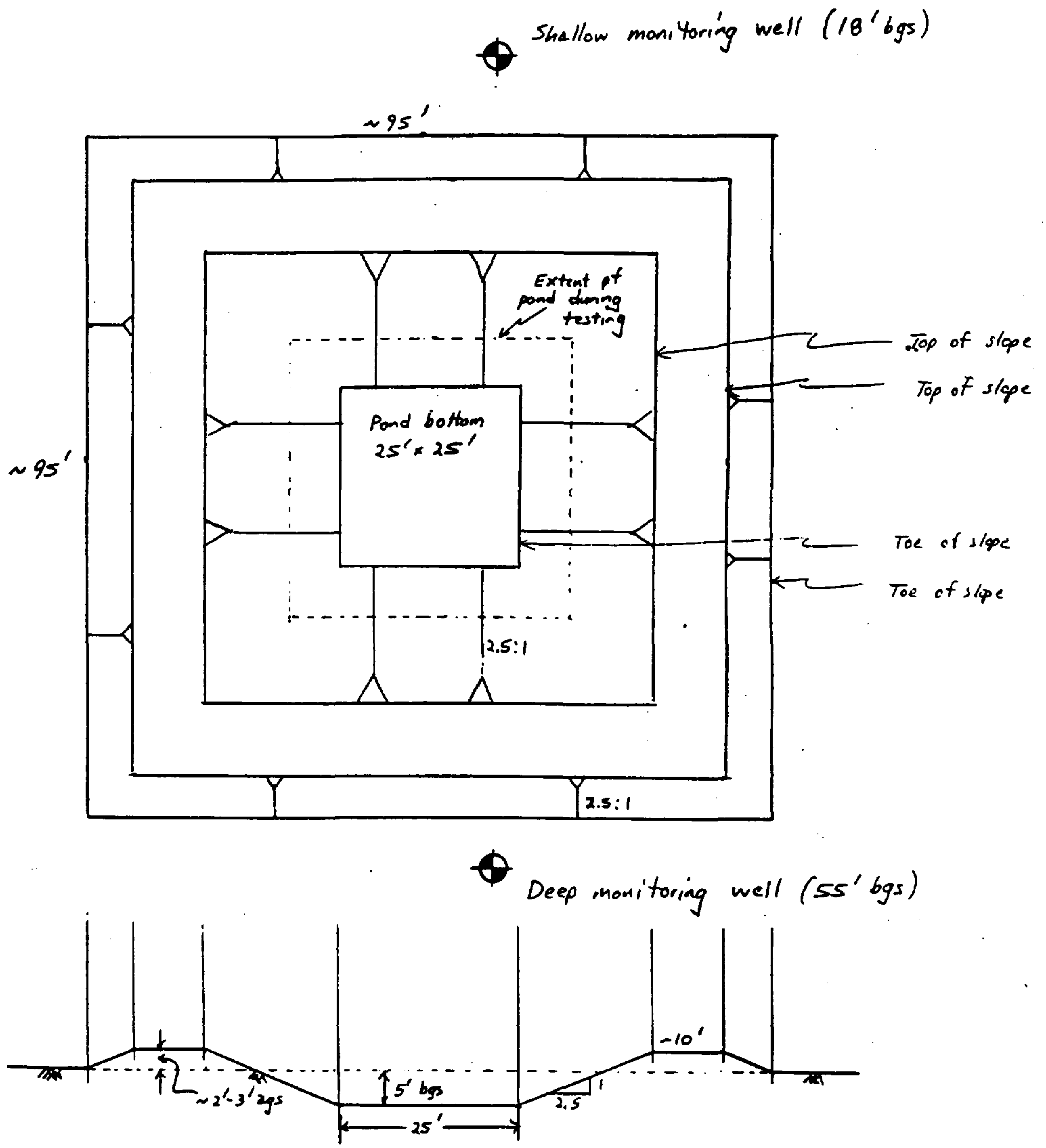
Bechtel

Calculation Sheet

Originator ______ Date ______ Calc. No. ______ Rev. No. ______

Project Selma Pressure Treating Job No. 20376-034 Checked ______ Date ______

Subject Percolation Test Pit As-Built Sheet No. Figure 2



following sections briefly summarize the results of the borehole permeability and percolation pit testing.

2.1 Borehole Permeability Test Results

The borehole permeability test results indicated that the soils in the shallow vadose zone, at 5 feet and 10 feet below ground surface, would be suitable for the percolation pit test (Option 1). The vertical hydraulic conductivity was estimated to be approximately 2 feet per day, based on the average of four tests. An area of approximately 170 feet by 170 feet was estimated to be required for recharge of the treatment plant design capacity of 300 gallons per minute, assuming a recharge rate approximately equal to the estimated vertical hydraulic conductivity. Sufficient area of unused land remains at the Selma site to accommodate much more than this preliminary pond size.

2.2 Percolation Test Pit Results

Subsequent to pond filling, the test period duration was approximately 45 days (12:11 on July 9 through 13:32 on August 23, 1996). Based on hydrant meter readings, the total water volume placed in the pond was 391,000 gallons, with an average flow rate of 6.02 gallons per minute. The total pan evaporation measured during the test was 20.9 inches. The measured pan evaporation, assuming a pan coefficient of 0.7, represents an evaporation rate of 0.03 feet per day. The net infiltration rate, with negligible adjustment for evaporation, was estimated to be 1.1 feet per day, assuming an effective infiltration area of 32 feet by 32 feet for the percolation test.

Significant decreases in the flow rate or infiltration rate during the test did not occur, and in fact, the final rate was slightly higher than during the initial portion of the test. A relatively steady rate of increase in the water table level was indicated to begin about 4 days after starting the test, but the change (about 1 ft in 45 days) may reflect slight seasonal variation in the local water table in combination with slight water table mounding. The shallow monitoring well (screened 8 to 18 ft bgs) remained dry throughout the test, suggesting absence of perched water mounding.

2.3 Recommendations for Recharge Pond

By direct extrapolation of the percolation pit test results, the required pond bottom area for the treatment plant discharge of 300 gallons per minute is 228 feet by 228 feet. However, pond bottom dimensions of 200 feet by 260 feet are recommended for the recharge pond, to more conveniently fit within the unused land at the Selma site. A duplicate or standby pond is recommended to allow continuous operation of the treatment plant when maintenance activities are required in the recharge pond.

The infiltration capacity of the constructed ponds must be verified during startup. Activities during pond construction, such as unintended excessive reworking and compaction of the pond bottom during excavation, could result in infiltration rates different than those estimated from the recharge test. Such activities which would tend to reduce the infiltration rate are to be avoided.

ATTACHMENT 1

RESULTS OF GEOLOGIC LOGGING, WELL INSTALLATION, AND BOREHOLE PERMEABILITY TESTING

C34 00266

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ARCSWEST - Selma Pressure Treating Site

To:	M. Sholley and W. Sweet-Dodge	Date:	July 1, 1996
Company:	Bechtel National	cc:	Prem Attanayake M. Lau/EPA
From:	M. Janowiak		
Phone:	8-8224		
Location:	San Francisco, CA		

Introduction

The Selma Pressure Treating Superfund Site is located in Selma, California. The site was placed in the Superfund program because of groundwater and soil contamination. There is a groundwater pump-and-treat system proposed to control migration of a chromium plume. The system will pump up to a maximum of 250 gallons per minute. Treated groundwater will be recharged to the aquifer in an on-site recharge system.

On June 27, 1996, BSK Engineers drilled and logged two boreholes and conducted borehole permeability tests (Figure 1). Monitor wells were installed in the boreholes. The borings were drilled near the area where a recharge pilot test will be conducted. The purpose of these borings was to test the permeability of the shallow soils and to install monitor wells for the recharge pilot test.

Permeability test results were used to decide if recharge is best attained by recharge basins or by stone columns. Initial results indicate that the vertical hydraulic conductivity in the shallow vadose zone is approximately 2.0 ft/day (average of four tests, Kh/Kv = 10 from Table 1).

Methods, Results, and Discussion

The following presents the field methods and results of the geologic logging, well installation, and permeability testing.

Geologic Logging

Split-spoon sampling was conducted from 3.5 feet bgs to 45 feet bgs in boring #1. The upper 8 feet of soil was a damp silty sand to sandy silt. These soils were not cohesive. At 8.5 feet bgs, there was a distinct contact where the deeper material was a fine sand. Only a trace of silt was present. The fine sand extended to a depth of approximately 18 feet bgs. From 18 to 25 feet bgs, the lithology was a silty sand to sandy silt. From 25 feet to approximately 40 feet bgs, a fine sand was encountered. At approximately 40 feet, there was a caliche or weakly-cemented silty sand. At this depth there was a color change from olive brown to a reddish brown. Groundwater was encountered at 49 feet bgs.

At site #2, the lithology was similar to site #1. There were very thin coarse sand beds (2 to 3 inches) encountered in this zone in the 17 to 18 feet bgs interval. This indicates that the silt encountered from 18 to 25 feet bgs at site #1 may not be vertically continuous.

Well Installation
A monitor well was installed in Test #1 with the screened interval extending from 54.5 feet to 44.5 feet bgs in this borehole. In Test #2, the monitor well screened interval extended from 17.5 to 7.5 feet bgs.

The wells were constructed with 2-inch diameter, schedule 40 PVC, 0.010-inch machine slot screen and blank casing to the surface. Monterey #3 sand was used for the filter pack, which extended 2 feet above the top of the screen. Bentonite chips were placed on top of the filter pack and hydrated. Neat cement grout was placed over the bentonite plug to ground surface and the wells were completed with a 6-inch diameter surface casing.

Test #1 was installed as a water table well to monitor mounding associated with recharge water from the pilot test. Test #2 was installed at the top of the silt unit encountered at a depth of 18 feet to monitor potential perching on that unit as the recharge test progresses.

Permeability Testing
Permeability testing was done as follows:
1. a soil sample was collected from 3.5 to 5.0 feet bgs,
2. the borehole was reamed to 5.0 feet,
3. augers were lifted one foot,
4. sand was placed into the hole to a point several inches into the auger stem,
5. a water-level sounder was placed at a preset depth 10 inches above the sand,
6. the hole was filled with water up to the depth monitored by the sounder using one-liter containers,
7. elapsed time was measured and recorded as time since first water was placed in the borehole,
8. one liter of water was added when the sounder indicated water levels dropped to just below the sounder level,
9. when water take had stablized (usually after about 10 minutes), the test was continued to measure the average rate of take in the borehole.

By adding water in one-liter increments the head was maintained at a +/- 2.5 inch interval about the sounder level.

The first test at site #1 was conducted with a much higher head (several feet) rather than 10 inches.

Table 1 is summary of test parameters and the resulting vertical hydraulic conductivities calculated for each of the four tests. The vertical hydraulic conductivities ranged from 0.35 ft/day to 3.01 ft/day. The shallow lithologies had lower Kv compared to the deeper lithologies, but only marginally at site #2.

Summary
The vertical hydraulic conductivities, as measured at the two boreholes, are high enough that a recharge pond should be tested instead of a stone column. There appears to be sufficient area at the Selma Pressure Treating site to accommodate ponds of the dimensions needed for recharge of 250 gpm (Table 2). This will be further tested during the pilot study. Monitor wells installed in the test basin area can be used to evaluate perching of the recharge water and mounding effects on the water table.

References
(see tables 1 and 2)

Attachments
1. Geologic logs (final logs due from BSK)
2. Well construction diagrams
3. Permeability Test Data

Table 1
Selma Near-Surface Infiltration Tests

Test location	Test depth (inches)	Material tested	Hole diameter (inches)	Effective area of test hole (ft^2)	Approximate head (inches)	Test duration (min)	Water volume added (mL)	Time required to infiltrate (min)	Flow rate (L/hr)	Flow rate (ft^3/day)	Vertical hydraulic conductivity, K_v [1] (assume K_h/K_v=1) (ft/day)	Vertical hydraulic conductivity, K_v [1] (assume K_h/K_v=10) (ft/day)	Notes
1	60	Silty Sand (20 to 40% silt)	6	0.20	30	60	43000	55	46.91	39.76	2.34	0.35	Higher head than other tests
1	120	Fine Sand with Silt (<10% silt)	6	0.20	10	30	21000	19.25	65.45	55.48	16.32	3.01	
2	60	Silty Sand (20 to 40% silt)	6	0.20	10	30	23000	29	47.6	40.3	11.9	2.19	Cleaner sand in sampler shoe, may be reason for higher K than at #1
2	120	Fine Sand with Silt (<10% silt)	6	0.20	10	23	22000	23.3	56.7	48.0	14.1	2.60	

Notes:
[1] Horizontal hydraulic conductivity, $K_h = Q \ln [\, mL/D + (1 + (mL/D)^2)^{0.5}\,] / (2 \pi L H_c)$ (Lambe & Whitman, p. 284-285, for open borehole, uniform soil, constant head), where "transformation ratio", $m = (K_h/K_v)^{0.5}$, and D = hole diameter, L = saturated length, H_c = constant head, and Q = water flow. Try m = 0.1, 1, and 10.

Table 2

Green & Ampt Infiltration Equation | **Pond Sizing Estimate**

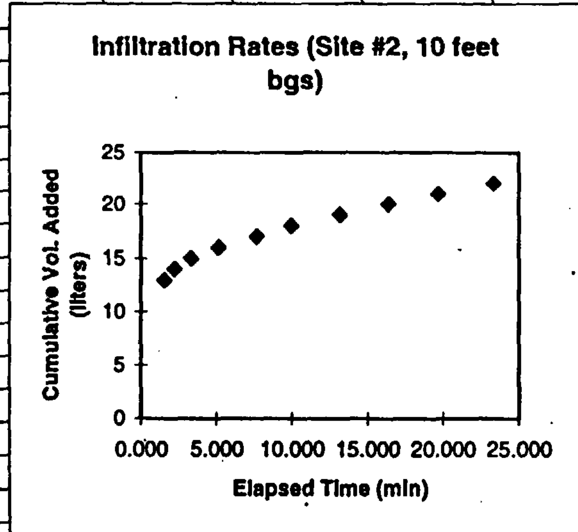
Hydraulic conductivity, K_{wetted} (ft/day)	pressure head of soil for wetting, h_{cr} (ft)	Depth of water above soil, H_w (ft)	Depth of wetting front, L_f (ft)	Infiltration rate, v_i [1] (ft/day)	Required flow, Q (gal/min)	Required pond dimension, W [2] (ft)
Assume K_v from Lambe & Whitman analysis corresponds to K_{wetted}:						
0.35	-2.0	2	10	0.49	250	371
3.01	-2.0	2	10	4.20	250	126
2.19	-2.0	2	10	3.06	250	148
2.60	-2.0	2	10	3.63	250	136
Assume K_v from Lambe & Whitman analysis corresponds of v_i:						
1.28	-2.0	0.67	1	0.35	250	194
11.04	-2.0	0.67	1	3.01	250	66
7.96	-2.0	0.67	1	2.19	250	78
9.53	-2.0	0.67	1	2.60	250	71
0.82	-2.0	0.67	2	0.35	250	243
7.02	-2.0	0.67	2	3.01	250	83
5.08	-2.0	0.67	2	2.19	250	97
6.03	-2.0	0.67	2	2.60	250	89
0.66	-2.0	0.67	3	0.35	250	270
5.65	-2.0	0.67	3	3.01	250	92
4.11	-2.0	0.67	3	2.19	250	108
4.88	-2.0	0.67	3	2.60	250	99

Notes:

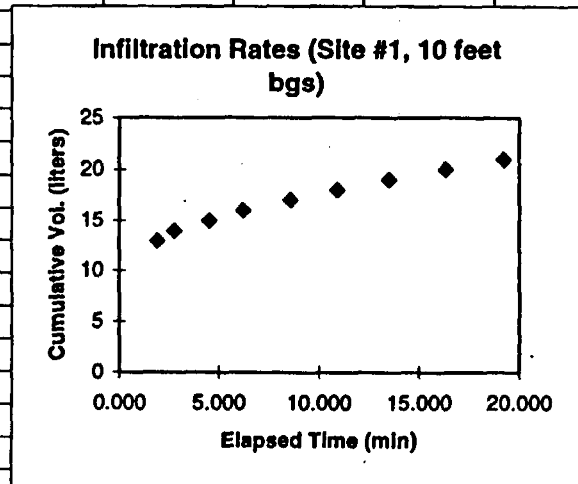
(1) Infiltration rate, $v_i = K (H_w + L_f - h_{cr}) / L_f$ (Bouwer, 1978, p. 253).

(2) Required pond dimension, $W = Q / K_{wetted}$.

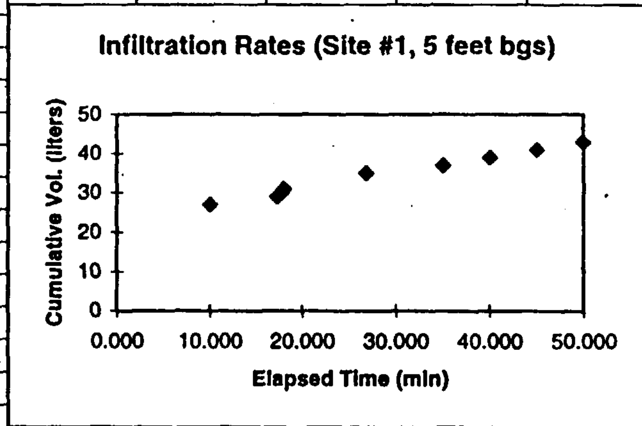
Elapsed Time min	sec		Vol. Added (liters)	Total Volume (liters)	Water Depth (ft bgs)
1	33	1.550	13	13	-8.5
2	13	2.217	1	14	-8.5
3	20	3.333	1	15	-8.5
5	9	5.150	1	16	-8.5
7	40	7.667	1	17	-8.5
9	56	9.933	1	18	-8.5
13	10	13.167	1	19	-8.5
16	24	16.400	1	20	-8.5
19	41	19.683	1	21	-8.5
23	20	23.333	1	22	-8.5



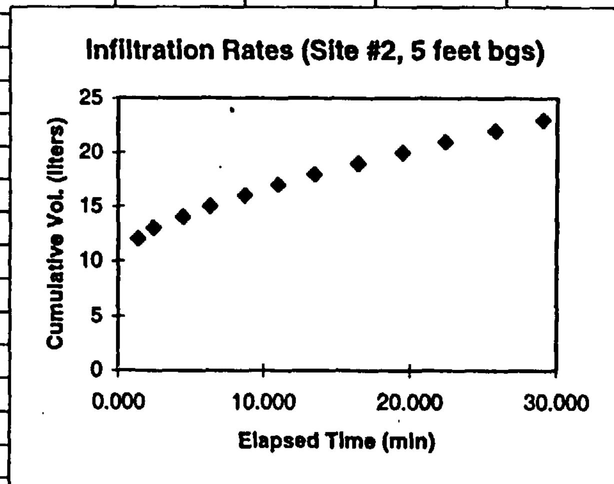
Elapsed Time min	sec		Vol. Added (liters)	Total Volume (liters)	Water Depth (ft bgs)
1	55	1.917	13	13	-8.5
2	46	2.767	1	14	-8.5
4	30	4.500	1	15	-8.5
6	13	6.217	1	16	-8.5
8	35	8.583	1	17	-8.5
10	55	10.917	1	18	-8.5
13	30	13.500	1	19	-8.5
16	20	16.333	1	20	-8.5
19	15	19.250	1	21	-8.5



Elapsed Time min	sec		Vol. Added (liters)	Total Volume (liters)	Water Depth (ft bgs)
10	0	10.000	27	27	-1
17	15	17.250	2	29	-1
17	45	17.750	1	30	-1
17	58	17.967	1	31	-1
26	50	26.833	4	35	-1
35	0	35.000	2	37	-1
40	0	40.000	2	39	-1
45	0	45.000	2	41	-1
50	0	50.000	2	43	-1



Elapsed Time min	sec		Vol. Added (liters)	Total Volume (liters)	Water Depth (ft bgs)
1	21	1.350	12	12	-3.5
2	25	2.417	1	13	-3.5
4	26	4.433	1	14	-3.5
6	18	6.300	1	15	-3.5
8	43	8.717	1	16	-3.5
11	0	11.000	1	17	-3.5
13	32	13.533	1	18	-3.5
16	30	16.500	1	19	-3.5
19	30	19.500	1	20	-3.5
22	25	22.417	1	21	-3.5
25	50	25.833	1	22	-3.5
29	5	29.083	1	23	-3.5



BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
SELMA Pressure Treating	20376	1	TEST 1

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
SELMA Pres		90	

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
6/27/96	6/27/96	DAVE	CME HSA	6"			

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
			2.5' Stickup		49	55

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140 lb / 30 in	2" 55'	M. JANOWIAK

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE / LENGTH CORE RUN	SAMPLE RECOVERY / CORE RECOVERY	SAMPLE BLOWS / PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
			gravel from top of hole					0			GRAVEL Sand with gravel Brown	
SPT	1 4 6 9		3.5 5.0					3–6			Sandy clay [illegible] brown SILT - [illegible] brown - slightly moist, [illegible] SAND - fine sand with silt, slightly moist, micaceous, loose	Sampled 3.5' to 5.0 9:47 AM
								7–8			SILTY CLAY/CLAYEY SILT - [illegible], ~25-30% [illegible]	
SPT	6 7 13		8.5 10.0					9–10			SAND - >95% fine to medium sand, slightly moist	
	10 11 14		17 18.5					18			SANDY SILT to SILTY SAND - fine sand and silt DAMP, LOOSE,	
								25			SILTY SAND to SAND - loose	

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE	HOLE NO.
Selma Pressure Treating	Test #1

H&CF 19-1

BECHTEL

GEOLOGIC DRILL LOG

PROJECT: Selma Pressure Treating | JOB NO.: 20376 | SHEET NO.: 2 of 2 | HOLE NO.: Test#1

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE	LENGTH CORE RUN	SAMPLE RECOVERY	CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
											30				
											32				
											34				
											36			Grades to fine sand	
											38				
											40	Cal		SILTY SAND w/caliche [illegible]	
											42				
											44			Silty Sand	
											46			20% silt, 80% fine sand	
											48	▽		DTW 49.0'	
											50				
											52				
											54			TD at 55' 6/27/96	
											56			DTW = 46.5' at 4:12 PM	ground surface not TOC

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Selma Pressure Treating

HOLE NO.: Test #1

BECHTEL

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
SELMA Pressure Treating	20376	1	TEST 2

SITE	COORDINATES	ANGLE FROM HORIZ.	BEARING
		90	

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
6/27/96	6/27/96	BSK / Dave	CME	6"	55		55'

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
					49.0	

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
	2" 18'	Matt Janowicz

13
15
24

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "6" PERCENT CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
								2				
							3.5 5.0	4			SILTY SAND - loose, olive brown DAMP, [illegible], 20% silt, 80% fine sand	
8/6/8								6				
								8				
9/6/9							8.5 10	10			SAND - [illegible] brown, trace damp, trace silt, >[illegible]% fine sand.	
								12				
								14				
13/15/24	SPT		15 16.5					16			INTERBEDDED SILT and SAND SILT is [illegible]%, silt + fine sand SAND is coarse and medium	Driller noted slow advance @ 15'
12/10/25	SPT		18					18			SANDY SILT @ 18' [illegible] w/ [illegible] stains - mottled, 40% [illegible] sand, 60% silt TD at 18.0'	

3.2' stickup - from ground surface to top of surface casing

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER	SITE	HOLE NO.

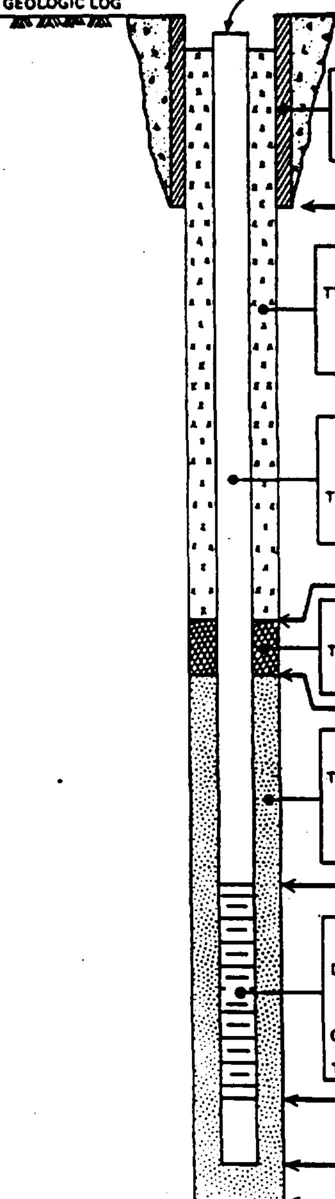
H&CF 19-1

MONITORING WELL

PROJECT	WELL NO.
SELMA Pressure Treating	TEST #1

JOB NO.	SITE	COORDINATES
22376-031		

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
6/27/86	6/27/86	M Janowick	



GENERALIZED GEOLOGIC LOG

ELEVATION - TOP OF RISER CASING

GROUND SURFACE

SURFACE CASING
DIA: 10"
TYPE: Steel w/ locking cap

BOTTOM OF SURFACE CASING

BACKFILL MATERIAL
TYPE: Neat Cement

RISER CASING
DIA: 2"
TYPE: Schedule [illegible] PVC
[illegible]

TOP OF SEAL

ANNULAR SEAL
TYPE: Bentonite chips/hydrated after placing in hole

TOP OF FILTER PACK

FILTER PACK
TYPE:

TOP OF SCREEN

SCREEN:
DIA: 2"
TYPE: Sched. 40 PVC Machine slot
OPENINGS WIDTH: 0.010"
TYPE: Machine slot

BOTTOM OF SCREEN

BOTTOM OF SUMP

BOTTOM OF HOLE

6.0" HOLE DIA

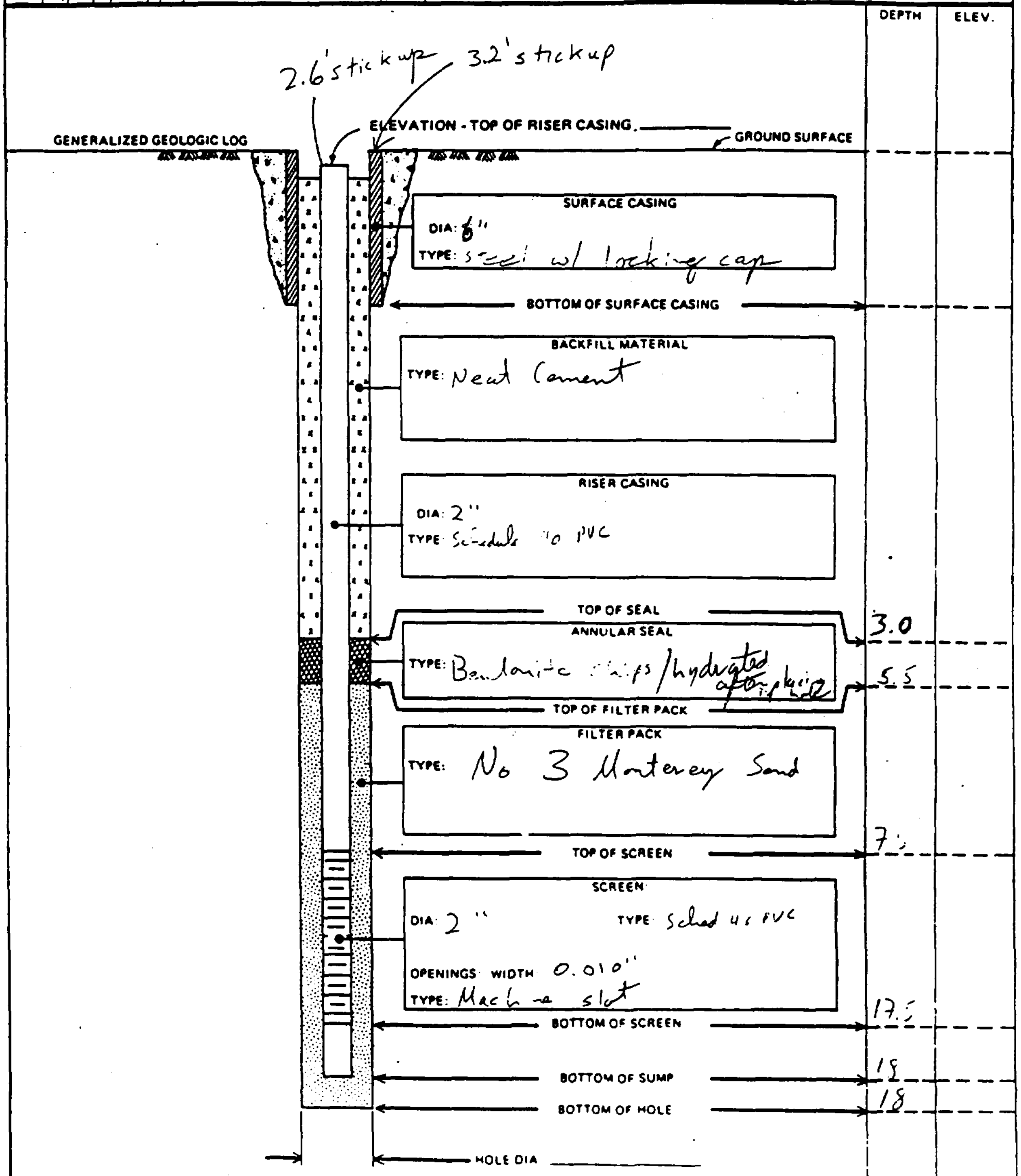
	DEPTH	ELEV.
GROUND SURFACE		
BOTTOM OF SURFACE CASING		
TOP OF SEAL	40.5	
TOP OF FILTER PACK	42.5	
TOP OF SCREEN	44.5	
BOTTOM OF SCREEN	59.5	
BOTTOM OF SUMP	55	
BOTTOM OF HOLE	55	

MONITORING WELL

PROJECT		WELL NO.
		TEST #2

JOB NO.	SITE	COORDINATES

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
6/27/96	6/27/96		



FIELD PERMEABILITY TEST REPORT — BECHTEL INCORPORATED

PROJECT: SELMA Pressure Treating
LOCATION: SELMA CA
CLIENT: EPA
CONTRACTOR: BSK
DRILLER: BSK INSPECTOR: ____
INSTALLATION DATE: 6/27/96 TEST DATE: 6/27/96

JOB NO. 20376-034
TEST NO. #1
BORING NO. TEST #1
LOCATION ____
SHEET 1 OF ____

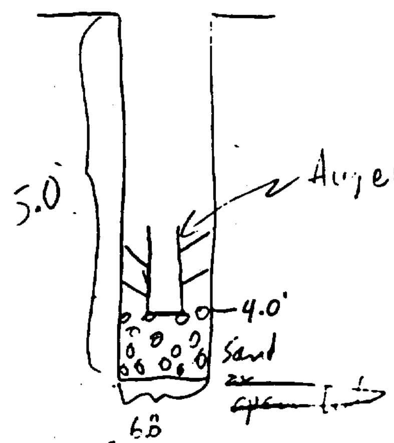
TYPE INSTALLATION BOREHOLE

TYPE TEST Constant Head Permeability
TYPE CASING – LENGTH – I.D. –
TEST SECTION LENGTH 2.0 I.D. 6.0"
SOIL DESCRIPTION Silt and Sand

DISTANCES RELATIVE TO GROUND SURFACE (FEET):
(+) = Above Ground Surface
(-) = Below Ground Surface

STATIC WATER None
TOP OF CASING ____ BOTTOM OF CASING ____
TOP OF TEST -2.0' BOTTOM OF TEST -5.0'

REMARKS / SKETCH



PERMEABILITY TEST DATA

	TIME (HOURS-MINS)	ELAPSED TIME (MIN.-SEC.)	METER READING	WATER QUANTITY (GALLONS)	DEPTH TO WATER FROM TOP OF CASING (FEET)	REMARKS
		10:00:00		27 liters	-2.0	1, 2, 3, 4, 5, 6
		12:09			-2.3	
		15:40			-2.6	7, 8, 9, 10, 11,
		17:15	(+2 litres)	29 liters	-2.3	12, 13, 14, 15, 16,
	0.5 min	17:45	(+1 litre)			
4	0.25 min	17:58	(+1 litre)	31 litres		17, 18, 19, liters
		19:30			-2.2	
		21:50			-2.4	+ 8 litres
		25:30			-2.7	27 liters
4	9 min	26:50	(+4 litres)	35 litres	-2.0	
		30:05			-2.2	
		32:53			-2.3	
2	8 min	35:00	(+2 litres)	37 litres	-2.1	
		38:50			-2.4	
2	5 min	40:00	(+2 litres)	39 litres	-2.1	
2	5 min	45:00	(+2 litres)	41 litres	-2.0	
	2.5 min	50:10	(+2 litres)	43 litres	-1.9	
		55:00		43 litres	-2.2	

FIELD PERMEABILITY TEST REPORT	BECHTEL INCORPORATED

PROJECT: SELMA
LOCATION:
CLIENT: EPA
CONTRACTOR: BSK
DRILLER: BSK INSPECTOR:
INSTALLATION DATE: 6/27/96 TEST DATE:

JOB NO. 20376
TEST NO. 2
BORING NO. TEST #2
LOCATION
SHEET ___ OF ___

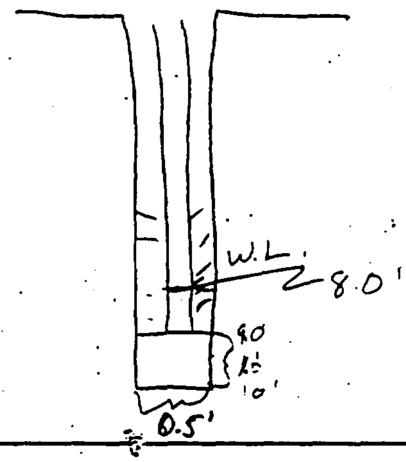
TYPE INSTALLATION BOREHOLE

TYPE TEST
TYPE CASING ___ LENGTH ___ I.D. ___
TEST SECTION LENGTH ___ I.D. ___
SOIL DESCRIPTION

DISTANCES RELATIVE TO GROUND SURFACE (FEET):
(+) = Above Ground Surface
(-) = Below Ground Surface

STATIC WATER —
TOP OF CASING ___ BOTTOM OF CASING 9.0
TOP OF TEST ___ BOTTOM OF TEST 10.0'

REMARKS / SKETCH



PERMEABILITY TEST DATA

TIME (HOURS-MINS)	ELAPSED TIME (MIN-SEC.)	METER READING	WATER QUANTITY ~~(GALLONS)~~	DEPTH TO WATER FROM TOP OF CASING (FEET)	REMARKS
10:30	1:55		13 litres	-8.0	
0.9 min	2:46	+1 litre	14 litres	-8.0	
1.5 min	4:30	+1 litre	15 litres	-8.0	
1.75 min	6:13	+1 litre	16 litre	-8.0	
2.3	8:35	+1 litre	17 litre	-8.0	
2.3 min	10:55	+1 litre	18 litre	-8.0	
2.6 min	13:30	+1 litre	19 litres	-8.0	
2.8 min	16:20	+1 litre	20 litres	-8.0	
3.0 min	19:15	+1 litre	21 litres	-	

FIELD PERMEABILITY TEST REPORT

PROJECT: SELMA PRESSURE TREATING JOB NO. 20376-034
BORING NO. Test #2 TEST NO. 1 SHEET 1 OF
LOCATION
COORDINATES TEST DATE 6/27/96
DRILLING CONTRACTOR BSK DRILLER DAVE
DRILLING FLUID NONE SUPERVISOR

TYPE OF TEST Constant Head Permeability
TYPE OF CASING I.D.
LENGTH OF CASING (FT.)
TEST SECTION LENGTH 1.5'
I.D. SOIL DESCRIPTION

DEPTH OF TEST (FT.) 5.0
ELEVATIONS (FT. AMSL):
SURFACE ELEVATION –
TOP OF CASING – BOTTOM OF CASING –
TOP OF TEST -3.5' BOTTOM OF TEST -5.0'
STATIC WATER LEVEL -3.5 bgs

REMARKS / SKETCH

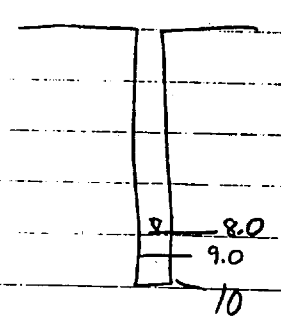
PERMEABILITY TEST DATA

CLOCK TIME (HOURS-MINS.)	ELAPSED TIME (MIN.)	METER READING	WATER QUANTITY ~~(GALLONS)~~	DEPTH TO WATER (FEET)	REMARKS
1:20	1:21		12	-3.5	
1.0 min	2:25	+1 litre	13	-3.5	
2.0 min	4:26	+1 litre	14	-3.5	
1.8 min	6:18	+1 litre	15	-3.5	
	8:43	+1 litre	16	-3.5	
	11:00	+1 litre	17	-3.5	
	13:32	+1 litre	18	-3.5	
	16:30	+1 litre	19	-3.5	
	19:30	+1 litre	20	-3.5	
	22:25	+1 litre	21	-3.5	
	25:50	+1 litre	22	-3.5	
	29:05	+1 litre	23		

Permeability
TEST #2 6/27/96 Test Hole
Boring #2

Time (min & sec)	Vol. H_2O	#1	Depth Below Ground S.
1:33	13		-8.[illegible]
2:13	1	14	-8.0
3:20	1	15	
5:09	1	16	
7:40	1	17	
9:56	1	18	
13:10	1	19	
16:24	1	23	
19:41	1	21	
23:20	1	22	

TD - 10'
sanded hole



ATTACHMENT 2

PERCOLATION POND INFILTRATION TEST DATA

POND INFILTRATION TEST DATA
SELMA PRESSURE TREATING

Date (1996)	Time (hr.)	Δ Time (hr.)	Water Level (in. from base)	Meter (ft^3)	Δ Vol. (ft^3)	Ave. Flow (gpm)	Depth to Groundwater (in. from ToC)	Pan Evaporation			
							TH.1 (South)	Water Ht. (in.)		Water Temp (°F)	Evap. (inches)
								init.	end		
07/09	0605			792580							
	0705	1.00	0.0	793345	765	95.4					
	0810	1.08	14.3	794000	655	75.6	45.85				
	0902	0.87	21.0	794580	580	83.1					
	0955	0.88	28.0	795240	660	93.5					
	1104	1.15	31.9	795875	635	68.8	45.86				
	1211	1.12	33.1	796048	173	19.3					
	1310	0.98	33.0	796082	34	4.3					
	1408	0.97	33.0	796117	35	4.5					
	1505	0.95	33.0	796150	33	4.3	45.83				
	1602	0.95	32.9	796184	34	4.5					
	1659	0.95	32.9	796217	33	4.3					
	1808	1.15	32.9	796278	61	6.6	45.82				
	1900	0.95	32.8	796303	25	3.3		6.5			
	2003	1.05	32.5	796339	36	4.3	45.85				
	2100	0.95	32.4	796370	31	4.1					

BSK

POND INFILTRATION TEST DATA
SELMA PRESSURE TREATING
(continued)

Date (1996)	Time (hr.)	▲ Time (hr.)	Water Level (in. from base)	Meter (ft³)	▲ Vol. (ft³)	Ave. Flow (gpm)	Depth to Groundwater (in. from ToC)	Pan Evaporation			
							TH.1 (South)	Water Ht. (in.)		Water Temp (°F)	Evap. (inches)
								init.	end		
07/10	2159	0.98	32.5	796418	48	6.1	45.88				
	2258	0.98	32.6	796466	48	6.1					
	2400	1.03	32.8	796521	55	6.7	45.89				
	0058	0.97	32.8	796571	50	6.4					
	0158	1.00	32.9	796623	52	6.5	45.89				
	0300	1.03	33.0	796678	55	6.7					
	0400	0.97	33.0	796731	53	6.8	45.89				
	0500	1.00	33.1	796786	55	6.9					
	0600	1.00	33.3	796841	55	6.9	45.91	6.4	6.4		
	0700	1.00	33.3	796870	29	3.6					
	0804	1.07	33.3	796892	22	2.6	45.93				
	0858	1.10	33.0	796912	20	2.3					
	1000	1.03	33.0	796935	23	2.8	45.92				
	1103	1.05	32.9	796959	24	2.8		6.3	6.3	86	
	1210	1.12	32.9	796985	26	2.9	45.89				
	1306	0.93	32.9	797008	23	3.1					
	1404	0.97	32.5	797031	23	3.0	45.88	6.2	6.2	88	

BSK

POND INFILTRATION TEST DATA
SELMA PRESSURE TREATING
(continued)

Date (1996)	Time (hr.)	∆ Time (hr.)	Water Level (in. from base)	Meter (ft^3)	∆ Vol. (ft^3)	Ave. Flow (gpm)	Depth to Groundwater (in. from ToC)	Pan Evaporation			
							TH.1 (South)	Water Ht. (in.) init.	Water Ht. (in.) end	Water Temp (°F)	Evap. (inches)
07/10	1504	1.00	32.4	797058	27	3.4					
	1605	1.02	32.5	797096	38	4.6	45.85				
	1703	0.97	32.5	797133	37	4.8					
	1756	0.88	32.4	797168	35	4.9	45.84	6.1	6.1	97	0.4
	1900	1.07	32.4	797213	45	5.2					
	2000	1.00	32.4	797250	37	4.6	45.96				
	2100	1.00	32.4	797290	40	5.0	45.99				
	2159	0.98	32.4	797327	37	4.7					
	2259	1.00	32.3	797367	40	5.0	45.99				
	2400	1.03	32.4	797410	43	5.2	45.99				
07/11	0101	1.00	32.4	797451	41	5.1					
	0200	0.98	32.4	797493	42	5.3	45.99				
	0300	1.00	32.4	797534	41	5.1					
	0359	0.98	32.4	797576	42	5.3	45.99				
	0500	1.02	32.4	797613	37	4.5					
	0600	1.00	32.4	797651	38	4.7	45.99	5.8	5.8	74	0.3
	1300	7.00	32.5	797940	289	5.1	45.95				

POND INFILTRATION TEST DATA
SELMA PRESSURE TREATING
(continued)

Date (1996)	Time (hr.)	Δ Time (hr.)	Water Level (in. from base)	Meter (ft³)	Δ Vol. (ft³)	Ave. Flow (gpm)	Depth to Groundwater (in. from ToC)	Pan Evaporation			
							TH.1 (South)	Water Ht. (in.) init.	Water Ht. (in.) end	Water Temp (°F)	Evap. (inches)
07/11	1410	2.17	32.5	797990	50	2.9	45.92				
	1500	0.83	32.5	798020	30	4.5	45.92				
	1600	1.00	32.5	798070	50	6.2	45.92				
	1700	1.00	32.5	798120	50	6.2	45.92				
	1800	1.00	32.3	798150	30	3.7	45.92	5.6	5.6	88	0.2
	1900	1.00	32.4	798190	40	5.0	45.92				
	2000	1.00	32.8	798230	40	5.0	45.93				
	2100	1.00	32.4	798270	40	5.0	45.95				
	2202	1.03	32.3	798320	50	6.1	45.98				
	2305	0.95	32.4	798350	30	3.9	45.97				
	2359	0.98	32.4	798386	36	4.6	45.99				
07/12	0830	8.52	32.4	798755	369	5.4	45.99	5.4	5.4	77	0.2
	1100	1.50	32.4	798824	69	5.7	45.99	6.6			
	1430	3.50	32.5	799002	178	6.3	45.98				
07/13	1432	24.03	33.1	800255	1253	6.5	45.89	5.9	5.9	99	0.7
	1630	1.97	33.1	800350	95	6.0	45.89				
07/14	1436	22.10	32.5	801408	1058	6.0	45.88	6.2	6.2	98	0.5

POND INFILTRATION TEST DATA
SELMA PRESSURE TREATING
(continued)

Date (1996)	Time (hr.)	∆ Time (hr.)	Water Level (in. from base)	Meter (ft^3)	∆ Vol. (ft^3)	Ave. Flow (gpm)	Depth to Groundwater (in. from ToC) TH.1 (South)	Pan Evaporation: Water Ht. (in.) init.	Pan Evaporation: Water Ht. (in.) end	Pan Evaporation: Water Temp (°F)	Pan Evaporation: Evap. (inches)
07/15	1010	19.57	38.8	802581	1173	7.5	45.86	5.9	6.2	78	0.3
07/16	1040	24.33	35.8	803902	1321	6.8	45.85	5.7	6.1	78	0.5
07/17	1030	24.13	33.8	804842	940	4.9	45.83	5.6	6.6	80	0.5
07/19	0830	48.13	32.3	806771	1929	5.0	45.80	5.5	6.4	79	1.1
07/22	1830	82.00	30.2	809690	2919	4.4	45.73	4.7	7.0	92	1.4
07/24	1831	48.00	32.5	811966	2276	5.9	45.69	6.1	6.6	90	0.9
07/28	0630	84.00	35.3				45.63	4.8	6.8	72	1.8
07/31	1400	79.50	39.8	820612	8,646	7.5	45.55	5.1	6.6	86	1.7
08/02	1702	51.00	33.5				45.50	5.5	7.4	88	1.1
08/05	1803	71.00	30.0				45.44	6.0	7.1	88	1.4
08/08	1558	48.01	30.0				45.33	5.6	5.6	87	1.5
08/09	1430	22.51	29.0	828230	7,618	4.4					
08/13	1820	99.83	33.3				45.20	3.4	8.5	90	1.8
08/18	1128	113.17	35.0				44.91	6.1	7.7	80	2.4
08/23	1332	122.01	38.3	848297	20,067	7.5	44.79	5.5	5.5	82	2.2

ATTACHMENT 3

CALCULATION OF RECHARGE TEST INFILTRATION RATE AND
TREATMENT PLANT POND SIZE

CALCULATION COVER SHEET

PROJECT	JOB NO.	CALC NO.	SHEET
ARCSWEST - Selma Pressure Treating	*20376-034*	*C-003*	*1*
SUBJECT		DISCIPLINE	
Recharge Test Infiltration Rate & Treatment Plant Pond Size		*Geotech. & Environ. Technologies*	

CALCULATION STATUS DESIGNATION	PRELIMINARY	CONFIRMED	SUPERSEDED	VOIDED
	X			

COMPUTER PROGRAM/TYPE	SCP	MAINFRAME	PC	PROGRAM NO.	VERSION/RELEASE NO.
	X YES ☐ NO		X	*EXCEL*	*5.0*

No.	Reason for Revision	Total No. of Sheets	Last Sheet No.	By	Checked	Approved	Date
	Initial calculation	9	9	[signature]			

Record of Revisions

CALCULATION SHEET

		PROJECT	ARCSWEST - Selma
		JOB NUMBER	20376-034-023
		CALC NO.	C-003
SUBJECT	Recharge Test Infiltration Rate & Treatment Plant Pond Size	SHEET NO.	2 of 9
BY	Michael Sholley	DATE 9/11/96	SHEET REV 0

Table of Contents

1. Purpose

The purpose of this calculation is to determine the infiltration rate during the pond recharge test conducted July 10 through August 23, 1996, at Selma Pressure Treating site, and to estimate the required pond dimensions for the groundwater treatment system design capacity of 300 gal/min. This work is conducted as part of Subtask 023, "Percolation Tests", based on the Activity Work Plan (Bechtel, 1995b). Additional work completed for Subtask 023, installation of test monitoring wells and borehole permeability tests, are reported in Bechtel memorandum from Matt Janowiak, dated July 1, 1996. The design capacity requirement of 300 gal/min includes a contingency of 50% above the expected full-scale extraction system rate of 200 gal/min, based on an expected maximum of ten extraction wells at 20 gal/min per well (Bechtel, 1995a, pg. 6-1).

2. Methodology

Field measurements of cumulative flow at various times were used to determine average flow rate and to estimate the infiltration rate for the 45-day recharge pond test. Data was also collected on pan evaporation, ground-water table response, and potential perched mounding in the vadose zone. The recharge test was conducted within a test pit with dimensions of 5-ft depth and 25-ft by 25-ft bottom area, and side slopes of 2.5H:1V. The water depth in the test pond was maintained between 29 to 40 inches, but was typically 30 to 36 inches.

The data measurements (BSK, 1996) are summarized in Table 1. From the time that the pond was filled (to a water depth of 33 inches), the following parameters were calculated using ah EXCEL spreadsheet (Table 1):

- elapsed time (days),
- average pond depth (in.),
- average flow rate (gal/min),
- average evaporation rate (ft/day), and
- average infiltration rate (ft/day).

The infiltration rate was determined by dividing the average flow rate by the bottom area of the test pond plus one-half of the side slope area under water. Because of side slope compaction during excavation, the contribution of this portion of the pond area to infiltration is uncertain. The infiltration rate was adjusted for evaporation by multiplying the pan evaporation rate by a pan coefficient of 0.7 (Hjelmfelt and Cassidy, 1975).

This method of estimating the infiltration rate does not evaluate the effects of horizontal infiltration through pond sides or alternate pond water depths. As a result, this method of analysis may slightly overestimate the actual infiltration rate for a larger pond with shallower water depth. Recharge through the pond sides compared to through the pond bottom would be proportionally less for a larger pond than the test pond size (assuming vertical hydraulic conductivity is significantly lower than the horizontal conductivity, and neglecting side slope compaction effects). The infiltration rate for a pond water depth less than the test pond depth of 2.5 to 3 feet would be slightly less, but the reduction is much less than the proportional difference in head because of unsaturated flow conditions beneath the pond (i.e., mounded water table does not intercept the recharge pond).

Using this approach, the pond size required for discharge of the treatment plant rate of 300 gal/min was estimated from the approximate steady-state flow rate indicated by the recharge test:

- required discharge pond size = 300 gal/min treatment plant discharge rate / (test pond flow rate / test pond area - evaporation rate), and
- test pond area = $(25 \text{ ft} + 33.5 \text{ in.}/12 \times 2.5)^2 = (32 \text{ ft})^2$, where the pond area includes one-half of the side slopes under water during testing; average pond depth is 33.5 inches, and side slopes are 2.5H:1V.

3. Results

The 45-day recharge test indicated an average flow rate of 6.02 gal/min into the test pond (Table 1). The average evaporation rate was estimated to be 0.03 ft/day. The infiltration rate, adjusted for evaporation, was estimated to be 1.11 ft/day, based on an infiltration area of 32 ft by 32 ft. By direct extrapolation of the test results, the required pond bottom dimensions for the treatment plant discharge of 300 gal/min are 228 ft by 228 ft.

Significant decreases in the flow rate/infiltration rate during the test did not occur, and in fact, the final rate was slightly higher than during the earlier testing period (Figure 1). A relatively steady rate of increase in the water table level was indicated to begin about 4 days after starting the test (Figure 2), but the change (about 1 ft in 45 days) may reflect seasonal variation in the local water table in combination with water table mounding. The shallow monitoring well (screened 8 to 18 ft bgs) remained dry throughout the test, indicating absence of perched water mounding.

4. Conclusions

Pond bottom dimensions of 200 ft by 260 ft are recommended for recharge of the groundwater treatment plant discharge. A duplicate pond is recommended to allow continuous operation of the treatment plant during maintenance activities in one recharge pond. Maintenance activities are expected because of eventual partial clogging resulting from anticipated progressive accumulation of fines in the pond bottom. Because the required treatment discharge capacity of

300 gal/min already includes a 50% contingency beyond the expected full-scale extraction rate of 200 gal/min, additional conservatism in pond dimensions was not warranted.

The infiltration capacity of the constructed ponds must be verified during startup. Activities during pond construction, such as unintended excessive compaction of the pond bottom during excavation, could result in infiltration rates different than those estimated from the recharge test. Such activities which would tend to reduce the infiltration rate are to be avoided.

5. References

Bechtel, 1996, Description of borehole permeability tests and monitor wells for recharge test, July 1, 1996 (interoffice memorandum from M. Janowiak to M. Sholley and W. Sweet-Dodge).

Bechtel, 1995a, Submittal #1 - Evaluation of Full-Scale and Pilot-Scale Groundwater Treatment Plant and Extraction/Reinjection System Designs, June 16, 1995 (letter transmittal to Michelle Lau from Wileen Sweet-Dodge).

Bechtel, 1995b, Selma Pressure Treating Activity Work Plan, December 1995.

BSK & Associates, 1996, "Results of Pond Infiltration Test," August 26, 1996 (fax to Bechtel).

Hjelmfelt, A.T., Jr., and J.J. Cassidy, 1975, Hydrology for Engineers and Planners, Iowa State University Press.

CALCULATION SHEET

PROJECT	*ARCSWEST - Selma*
JOB NUMBER	*20376-034-023*
CALC NO.	*C-003*
SHEET NO.	*6 of 9*
SHEET REV	*0*

SUBJECT *Recharge Test Infiltration Rate & Treatment Plant Pond Size*

BY *Michael Sholley* DATE *9/11/96*

Table 1 - Recharge Test Data and Results

Field Measurements						Infiltration Estimate				
Date	Time	Pond Depth (in.)	Cumulative Flow (cu. ft)	Depth to Ground-water (ft)	Pan Evaporation (in.)	Elapsed Time (days)	Average Pond Depth (in.)	Average Flow Rate (gal/min.)	Average Evaporation Rate [a] (ft/day)	Average Infiltration Rate [b] (ft/day)
9-Jul	6:05	-	792,580		-	-	-	Begin flow		-
9-Jul	7:05	0.0	793,345		-	-	-	Pond filling		-
9-Jul	8:10	14.3	794,000	45.85	-	-	-	Pond filling		-
9-Jul	9:02	21.0	794,580		-	-	-	Pond filling		-
9-Jul	9:55	28.0	795,240		-	-	-	Pond filling		-
9-Jul	11:04	31.9	795,875	45.86	-	-	-	Pond filling		-
9-Jul	12:11	33.1	796,048		-	0	33.1	-		-
9-Jul	13:10	33.0	796,082		-	0.04	33.0	4.3		0.8
9-Jul	14:08	33.0	796,117		-	0.08	33.0	4.4		0.8
9-Jul	15:05	33.0	796,150	45.83	-	0.12	33.0	4.4		0.8
9-Jul	16:02	32.9	796,184		-	0.16	33.0	4.4		0.8
9-Jul	16:59	32.9	796,217		-	0.20	33.0	4.4		0.8
9-Jul	18:08	32.9	796,278	45.82	-	0.25	33.0	4.8		0.9
9-Jul	19:00	32.8	796,303		0	0.28	33.0	4.7		0.9
9-Jul	20:03	32.5	796,339	45.85	-	0.33	32.9	4.6		0.9
9-Jul	21:00	32.4	796,370		-	0.37	32.9	4.6		0.8
9-Jul	21:59	32.5	796,418	45.88	-	0.41	32.8	4.7		0.9
9-Jul	22:58	32.6	796,466		-	0.45	32.8	4.8		0.9
9-Jul	24:00	32.8	796,521	45.89	-	0.49	32.8	5.0		0.9
10-Jul	0:58	32.8	796,571		-	0.53	32.8	5.1		1.0
10-Jul	1:58	32.9	796,623	45.89	-	0.57	32.8	5.2		1.0
10-Jul	3:00	33.0	796,678		-	0.62	32.8	5.3		1.0
10-Jul	4:00	33.0	796,731	45.89	-	0.66	32.8	5.4		1.0
10-Jul	5:00	33.1	796,786		-	0.70	32.8	5.5		1.0
10-Jul	6:00	33.3	796,841	45.91	0.1	0.74	32.9	5.5	0.01	1.0
10-Jul	7:00	33.3	796,870		-	0.78	32.9	5.4		1.0
10-Jul	8:04	33.3	796,892	45.93	-	0.83	32.9	5.3		1.0
10-Jul	8:58	33.0	796,912		-	0.87	32.9	5.2		1.0
10-Jul	10:00	33.0	796,935	45.92	-	0.91	32.9	5.1		0.9
10-Jul	11:03	32.9	796,959		0.1	0.95	32.9	5.0	0.01	0.9
10-Jul	12:10	32.9	796,985	45.89	-	1.0	32.9	4.9		0.9
10-Jul	13:06	32.9	797,008		-	1.0	32.9	4.8		0.9
10-Jul	14:04	32.5	797,031	45.88	0.1	1.1	32.9	4.7	0.02	0.9
10-Jul	15:04	32.4	797,058		-	1.1	32.9	4.7		0.9
10-Jul	16:05	32.5	797,096	45.85	-	1.2	32.9	4.7		0.9
10-Jul	17:03	32.5	797,133		-	1.2	32.9	4.7		0.9
10-Jul	17:56	32.4	797,168	45.84	0.1	1.2	32.8	4.7	0.02	0.9
10-Jul	19:00	32.4	797,213		-	1.3	32.8	4.7		0.9
10-Jul	20:00	32.4	797,250	45.96	-	1.3	32.8	4.7		0.9
10-Jul	21:00	32.4	797,290	45.99	-	1.4	32.8	4.7		0.9
10-Jul	21:59	32.4	797,327		-	1.4	32.8	4.7		0.9
10-Jul	22:59	32.3	797,367	45.99	-	1.5	32.8	4.7		0.9
10-Jul	24:00	32.4	797,410	45.99	-	1.5	32.8	4.7		0.9
11-Jul	1:01	32.4	797,451		-	1.5	32.8	4.7		0.9
11-Jul	2:00	32.4	797,493	45.99	-	1.6	32.7	4.8		0.9

CALCULATION SHEET

		PROJECT	*ARCSWEST - Selma*
		JOB NUMBER	*20376-034-023*
		CALC NO.	*C-003*
SUBJECT	*Recharge Test Infiltration Rate & Treatment Plant Pond Size*	SHEET NO.	*7 of 9*
BY	*Michael Sholley* DATE *9/11/96*	SHEET REV	*0*

Table 1 - Recharge Test Data and Results

Field Measurements						Infiltration Estimate				
Date	Time	Pond Depth (in.)	Cumulative Flow (cu. ft)	Depth to Ground-water (ft)	Pan Evaporation (in.)	Elapsed Time (days)	Average Pond Depth (in.)	Average Flow Rate (gal/min.)	Average Evaporation Rate [a] (ft/day)	Average Infiltration Rate [b] (ft/day)
11-Jul	3:00	32.4	797,534		-	1.6	32.7	4.8		0.9
11-Jul	3:59	32.4	797,576	45.99	-	1.7	32.7	4.8		0.9
11-Jul	5:00	32.4	797,613		-	1.7	32.7	4.8		0.9
11-Jul	6:00	32.4	797,651	45.99	0.3	1.7	32.7	4.8	0.02	0.9
11-Jul	13:00	32.5	797,946	45.95	-	2.0	32.7	4.8		0.9
11-Jul	14:10	32.5	797,990	45.92	-	2.1	32.7	4.8		0.9
11-Jul	15:00	32.5	798,020	45.92	-	2.1	32.7	4.8		0.9
11-Jul	16:00	32.5	798,070	45.92	-	2.2	32.7	4.9		0.9
11-Jul	17:00	32.5	798,120	45.92	-	2.2	32.7	4.9		0.9
11-Jul	18:00	32.3	798,150	45.92	0.2	2.2	32.7	4.9	0.02	0.9
11-Jul	19:00	32.4	798,190	45.92	-	2.3	32.7	4.9		0.9
11-Jul	20:00	32.8	798,230	45.93	-	2.3	32.7	4.9		0.9
11-Jul	21:00	32.4	798,270	45.95	-	2.4	32.7	4.9		0.9
11-Jul	22:02	32.3	798,320	45.98	-	2.4	32.6	4.9		0.9
11-Jul	23:05	32.4	798,350	45.97	-	2.5	32.6	4.9		0.9
11-Jul	23:59	32.4	798,386	45.99	-	2.5	32.6	4.9		0.9
12-Jul	8:30	32.4	798,755	45.99	0.2	2.8	32.6	4.9	0.02	0.9
12-Jul	11:00	32.4	798,824	45.99	-	3.0	32.6	4.9		0.9
12-Jul	14:30	32.5	799,002	45.98	-	3.1	32.6	5.0		0.9
13-Jul	14:32	33.1	800,255	45.89	0.7	4.1	32.6	5.3	0.03	1.0
13-Jul	16:30	33.1	800,350	45.89	-	4.2	32.7	5.3		1.0
14-Jul	14:36	32.5	801,408	45.88	0.5	5.1	32.7	5.5	0.03	1.0
15-Jul	10:10	38.8	802,581	45.86	0.3	5.9	33.1	5.7	0.03	1.1
16-Jul	10:40	35.8	803,902	45.85	0.5	6.9	33.7	5.9	0.03	1.1
17-Jul	10:30	33.8	804,842	45.83	0.5	7.9	33.8	5.8	0.03	1.1
19-Jul	8:30	32.3	806,771	45.80	1.1	9.8	33.7	5.7	0.03	1.0
22-Jul	18:30	30.2	809,690	45.73	1.4	13.3	33.1	5.3	0.03	1.0
24-Jul	18:31	32.5	811,966	45.69	0.9	15.3	32.8	5.4	0.03	1.0
28-Jul	6:30	35.3	-	45.63	1.8	18.8	33.0		0.03	
31-Jul	14:00	39.8	820,612	45.55	1.7	22.1	33.7	5.8	0.03	1.1
2-Aug	17:02	33.5	-	45.50	1.1	24.2	34.0		0.03	
5-Aug	18:03	30.0	-	45.44	1.4	27.2	33.7		0.03	
8-Aug	15:58	30.0	-	45.33	1.5	30.2	33.4		0.03	
9-Aug	14:30	29.0	828,230		-	31.1	33.2	5.4		1.0
13-Aug	18:20	33.3	-	45.20	1.8	35.3	33.0		0.03	
18-Aug	11:28	35.0	-	44.91	2.4	40.0	33.1		0.03	
23-Aug	13:32	38.3	848,297	44.79	2.2	45.1	33.5	6.02	0.03	1.11
5-Sep	11:00	0.0	-	44.45	-	58.0				

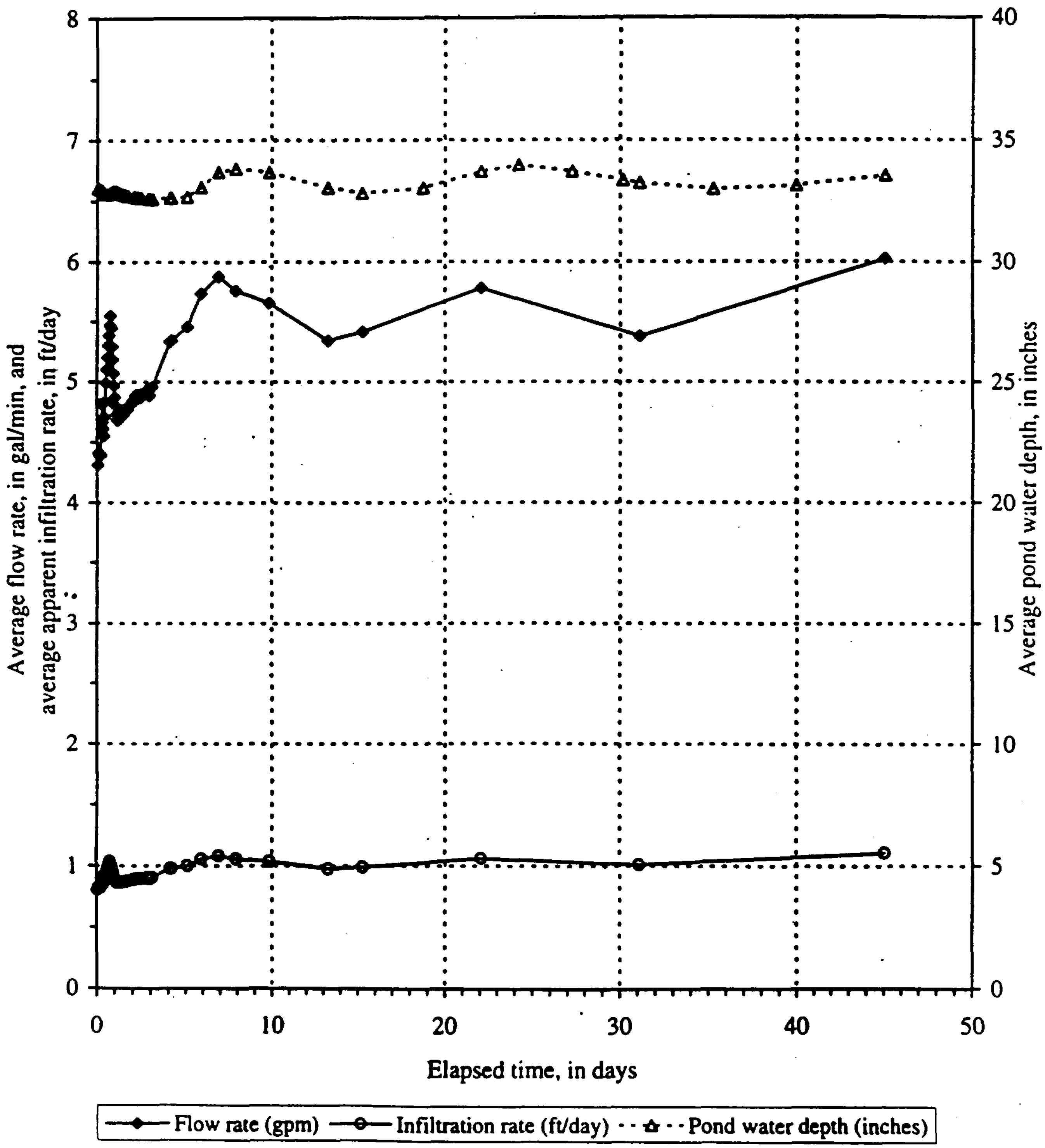
Notes:

[a] Evaporation rate estimate assumes pan coefficient of 0.7.

[b] Infiltration rate estimate assumes effective area of infiltration during testing of 32 ft x 32 ft.

CALCULATION SHEET		PROJECT	ARCSWEST - Selma
		JOB NUMBER	20376-034-023
		CALC NO.	C-003
SUBJECT	Recharge Test Infiltration Rate & Treatment Plant Pond Size	SHEET NO.	8 of 9
BY	Michael Sholley DATE 9/11/96	SHEET REV	0

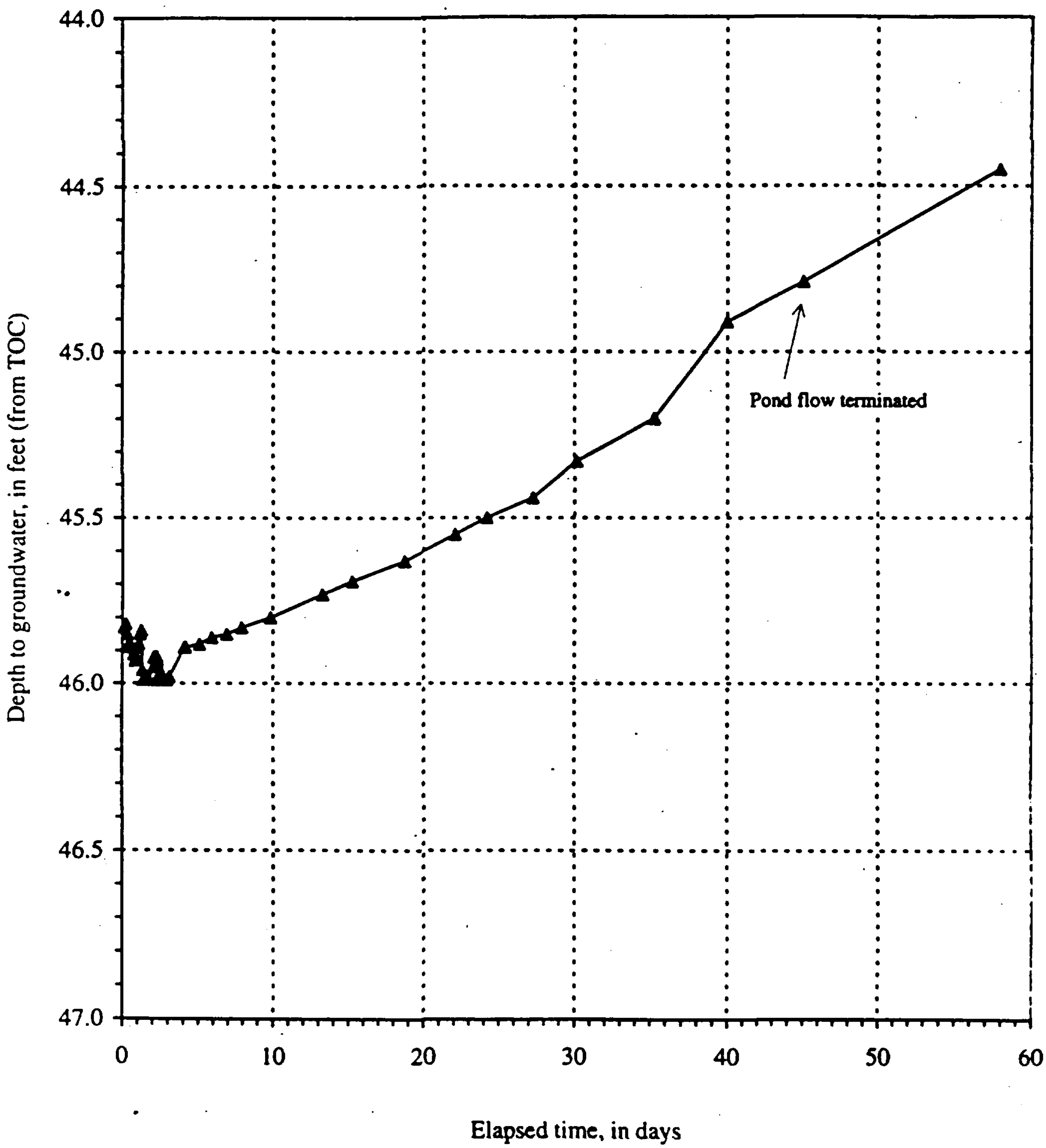
Figure 1 - Average Pond Water Depth, Flow Rate, and Infiltration Rate



CALCULATION SHEET

SUBJECT	*Recharge Test Infiltration Rate & Treatment Plant Pond Size*	PROJECT	*ARCSWEST - Selma*
BY	*Michael Sholley*	JOB NUMBER	*20376-034-023*
DATE	*9/11/96*	CALC NO.	*C-003*
		SHEET NO.	*9 of 9*
		SHEET REV	*0*

Figure 2 - Depth to Ground-water Table



ATTACHMENT 4

USEPA/Selma Pressure Treating Superfund Site

Groundwater Extraction-Recharge Basin/Treatment

Construction Cost Estimate

BEI

November 6, 1996

Project Data

Client: USEPA Region IX
San Francisco, California

Work Assignment: Selma Pressure Treating Superfund Site

Location: Selma, California

Estimate Scope: The estimate scope includes construction of groundwater extraction system, groundwater treatment plant and treated groundwater recharge basin.

A brief description of these three construction items are;

(A-1) Groundwater Extraction System
- Four (4) groundwater extraction wells and pumps
- 2,400 feet of HDPE piping delivering groundwater to treatment plant
- Leak detection system
- Bore/jack steel carrier pipe
- Electrical and control

(A-2) Recharge Basin
- Two (2) basins, 200' x 260' each
- 600 feet of PVC piping connecting between treatment plant and basins
- Basin inlet valves & flowmeters in two (2) manholes
- 1,800 feet of cyclone fence and a gate around the basins

(B) Groundwater Treatment Plant
- Sized to treat 300 gpm of extracted groundwater by chemical precipitation, clarification and filtration.
- Chromium is the contaminant of concern

Type of Estimate: Order of magnitude construction cost estimate. The Bechtel estimate updates an estimate previously prepared by Weston to reflect the latest design.

Pricing Level: Fourth Quarter 1996 Price and Wage Level.
The estimate has been escalated to 2Q 1997 at 3% per year.

Purpose of Estimate: To provide the client with the updated total construction cost for the project. The original estimate was prepared by Weston, Inc. in 1992.

Construction Schedule: Project schedule has not been finalized.

1.0 General

Selma Pressure Treating Co. is a former wood preserving site, located 15 miles south of Fresno, California. Beginning in 1981, EPA performed investigations at the site identifying both soil and groundwater contamination. Chromium is the contaminant of concern. A full scale groundwater extraction, treatment and reinjection scheme was proposed.

Roy F. Weston, Inc. (Weston) prepared a Remedial Action Design package based on this scheme and prepared a construction cost estimate in 1992. Subsequently, the decision was made by EPA to use a recharge basin concept for the treated-water disposal, instead of reinjection wells.

This estimate package was prepared based on the design modifications made by Bechtel Environmental, Inc (BEI) which includes use of a recharge basin instead of reinjection wells, and use of a pressure piping system instead of a gravity piping system (resulting in the elimination of 2 lift stations).

2.0 Estimate Methodology

This estimate has been prepared by escalating Weston's estimate from 1992 to 1996 and revising it to reflect the current modified scope.

The major cost revisions made on Weston's estimate are:

	Major Modifications	Weston's Estimate	This Estimate
Groundwater Extraction	- Piping	4,250 ft	2,400 ft
	- Lift station	2 ea	deleted
Recharge Basin	- Reinjection well	8 each	Deleted
	- Piping	6,900 feet	600 feet
	- Recharging Basin	None	Included

	Major Modification	Weston's Estimate	This Estimate
Groundwater Treatment Plant	- Flow Rate	500 gpm	300 gpm
	- Storage Tank	-	No modification
	- Piping	-	Minor modification
	-Process	Remove hexavalant chromium	Remove total chromium
	- Plot Arrangement	-	Minor modification

The cost of the Groundwater Treatment Plant has not been adjusted for this estimate based on the assumption that the cost decrease due to the lower flow rate may be offset by more sophisticated process equipment required to meet a more stringent process (removal of total chromium instead of hexavalant chromium). This assumption may require further verification by the contractor.

3.0 Estimate Basis

- Estimate pricing is based on 4th quarter 1996 price and wage level.

- Future escalation is included in the estimate at 3% per year.

- The composite direct labor wage included in the estimate is $ 35/hr.

- Material pricing and unit man-hour rates for civil work (recharge basin) are based on recent Means Construction Cost Data.

- The man-hours required for hazardous waste operator training is included in the estimate.

- Indirect field cost is included in the estimate at 100% of direct labor.

- Engineering, Procurement and Construction Management cost (EPCM) is excluded from the estimate per the original Weston estimate.

- Contingency is included in the estimate at 25% per the original Weston estimate.

4.0 Qualifications and exclusions

- It is assumed that the demolished asphalt and excavated soil for the recharge basin is not contaminated i.e. no hazardous waste disposal fee.

- It is assumed that the excavated soil can be disposed within 20 miles from the job site with no fee.

- It is assumed that there will be no dewatering during the excavation of recharge basins (water table at approximately 34 feet below the excavated basin).

- Cost of relocation of any underground and above ground utilities is not expected and therefore excluded.

- Agency oversight cost is excluded.

5.0 Estimate Results

Table 1	Construction Cost Estimate for Groundwater Extraction/Recharge Basin
Table 2	Construction Cost Estimate for Groundwater Treatment Plant
Attachment A	Construction Cost Estimate detail for Recharge Basin

Table 1
USEPA/Selma Pressure Treating Site

Groundwater Extraction/Recharge Basin
Construction Cost Estimate

Item No.	Weston Estimate* Scope	Qnty	Unit	Unit Cost	Total Cost	Estimate for Extraction/Recharge Basin Concept Scope	Qnty	Unit	Unit Cost	Total Cost
1	Mobilization	1	ls	281,475	281,475	Mobilization	1	ls	281,475	281,475
2	Clearing & grubbing	1	ls	5,629	5,629	Clearing & grubbing	1	ls	5,629	5,629
3	Reinjection well	8	ea	23,644	189,152	Delete				
4	12" PVC reinjection piping including cleanouts and sumps	4,454	lf	39	173,706	8" PVC class 150 piping including cleanouts and sumps	600	lf	39	23,400
5	4" PVC reinjection piping	2,419	lf	11	26,609	Delete				
6	Pressurized water system	1	ls	135,108	135,108	Delete				
7	Well head piping	12	ea	6,868	82,416	Well head piping	4	ea	6,868	27,472
8	Well vault	12	ea	2,815	33,780	Well vault	4	ea	2,815	11,260
9	Bore/jack steel carrier pipe	200	lf	563	112,600	Bore/jack steel carrier pipe	200	lf	563	112,600
10	Extraction well	4	ea	22,518	90,072	Extraction well	4	ea	22,518	90,072
11	4"/2" extraction piping	2,170	lf	68	147,560	4"/2" extraction piping	100	lf	68	6,800
12	10"/6" extraction piping	280	lf	126	35,280	10"/6" extraction piping	2,300	lf	126	289,800
13	12"/8" extraction piping	1,800	lf	169	304,200	Delete				
14	Leak detection system for extraction system	4,250	lf	12	51,000	Leak detection system for extraction system	2,400	lf	12	28,800
15	Lift station 1	1	ls	128,353	128,353	Delete				
16	Security fencing and gates	152	lf	23	3,496	Delete				
17	Lift station 2	1	ls	188,025	188,025	Delete				
18	Electrical & control (50 HP)	1	ls	394,065	394,065	Electrical & control (20 HP)	1	ls	160,000	160,000
19	Not used					Recharge basin (see Attach A)	1	ls	600,000	600,000
	Subtotal Construction Cost				2,382,526	Subtotal Construction Cost				1,637,308
	- Contingency at 25%				595,632	- Contingency at 25%				409,327
	round				21,842	round				53,365
	Total Construction Cost, 4Q 96				3,000,000	Total Construction Cost, 4Q 96				2,100,000
						- Escalate to 2Q 97 at 3%/yr				31,500
						Total Construction Cost, 2Q 97				2,131,500

* Original Weston's estimate of 1992 escalated to 4Q 96.

Table 2
USEPA/Selma Pressure Treating Site

Groundwater Treatment Plant
Construction Cost Estimate

Item	Description	Total Cost $
1	Mobilization	225,180
2	Equalization Tank	55,169
3	Chemical Storage Tank	81,065
4	Dirty Water Tank	30,399
5	Reactor Modules	340,022
6	Plate Separator/Thickener	263,461
7	Sand Filters	283,727
8	Effluent Storage Tanks	247,698
9	Filter Press	90,072
10	Foundation and Sitework	285,979
11	Pumps and Equipment	213,921
12	Piping and Valves	90,072
13	Electrical and Controls	281,475
14	O & M Trailer	11,259
15	Monitoring/Analysis System	45,036
	Subtotal Construction Costs	2,544,534
	Contingency at 25%	636,133
	round	19,333
	Total Construction Cost, 4Q 96*	3,200,000

* Original Weston's estimate of 1992 escalated to 4Q 96

FILE : J:\COMMON\YJYIM\ARCS\[SELMA-1.XLS]Table 1
DATE: 04-Nov-96

QTY BY:
EST BY:

Attachment A
USEPA/Selma Pressure Treating Site
Recharge Basin

Construction Cost Estimate

Location Selma, CA
Productivity 1.00
Labor Wage 35.00
PAGE

ITEM	DESCRIPTION	QTY	UNIT	UNIT COST			MANHOURS		WAGE	COSTS IN $				
				EQUIPT	MATLS	S/C	UNIT MH	TOTAL	RATES	EQUIPT	MATLS	LABOR	S/C	TOTAL
1.0	Recharge Basin, 2 ea, 200' x 260' each													
	Demolish existing asphalt surface, 500' x 250'	14,000	sy			2.20							30,800	$30,800
	Remove existing berm, 15'w x 3'h x 430' long	750	cy	1.40			0.06	45		1,050		1,575		$2,625
	Excavate for basin No. 1 & 2, 200'x260'x6', 2 ea	22,222	cy	1.40			0.06	1,333		31,111		46,666		$77,777
	Backfill with sand for basin No. 1 & 2, 1 foot thick	3,700	cy	0.60	12.00		0.02	74		2,220	44,400	2,590		$49,210
	Construct 2 ramps, 16'w x 50' long each	500	cy	1.20			0.05	25		600		875		$1,475
	Construct spillway, 16'w x 40'long													
	- Filter fabric, 10'x50'	500	sf		0.50		0.10	50			250	1,750		$2,000
	- 6" Reno mattress, 10'x50'	60	sy		10.00		0.05	3			600	105		$705
	- Gabon, 3'widex1'thickx160'long	20	cy		20.00		2.00	40			400	1,400		$1,800
	- Misc soil work, allow	100	cy	1.40			0.06	6		140		210		$350
	Provide manholes, 5' dia x 7' deep	2	ea		1,200		16	32			2,400	1,120		$3,520
	Construct new earth dike,15'w x 3' high x 1,000' long	1,700	cy	1.20			0.05	85		2,040		2,975		$5,015
	Provide a new cyclone fence, 6' high, 6 ga	1,800	lf			18.00							32,400	$32,400
	Haul & dispose demolished asphalt and excavated soil (Dispose within 20 miles with no fee)	25,000	cy	5.30			0.08	2,075		132,500		72,625		$205,125
	Allow for civil work required for level control and other misc items	1	lt		2,500		50	50			2,500	1,750		$4,250
	Hazardous waste operator training, allow at 8 people, 50 hours each	1	lt				400	400				14,000		$14,000
	Total Direct Field Cost							4,218		169,661	50,550	147,641	63,200	$431,052
	Indirect Field Cost at 100% of Direct Labor Cost													$147,641
	Round-off													$21,307
	TOTAL THIS PAGE. 4Q 96													$600,000